

Wedlock or deadlock?
***Feminists' attempts to engage irrigation
engineers***

Promotor:

Prof. Linden F. Vincent, hoogleraar in Irrigatie en waterbouwkunde
Wageningen Universiteit

Samenstelling promotiecommissie:

Prof. Dr. Patricia Howards, Wageningen Universiteit

Prof. Dr. Pieter van der Zaag, IHE-UNESCO, Delft

Prof. Dr. Cecile Jackson, University of East-Anglia, Norwich, UK

Dr. Loes Schenk-Sandbergen, Universiteit van Amsterdam

Dit onderzoek is uitgevoerd binnen de onderzoeksschool CERES

Wedlock or deadlock?

*Feminists' attempts to engage
irrigation engineers*

Margreet Z. Zwarteveen

Proefschrift

ter verkrijging van de graad van doctor
op gezag van de rector magnificus
van Wageningen Universiteit,
Prof. Dr. M. J. Kropff,
in het openbaar te verdedigen
op dinsdag 6 juni 2006
des namiddags te vier uur in de Aula

WEDLOCK OR DEADLOCK? FEMINISTS' ATTEMPTS TO ENGAGE IRRIGATION ENGINEERS.
Wageningen UR. Promotor: Vincent, L.F. Wageningen: Margreet Z. Zwarteveen,
2006. - p. 304.

ISBN: 90-8504-398-0

Copyright © 2006, by Margreet Z. Zwarteveen, The Netherlands

Contents

Tables and figures	9
Acronyms.....	10
Glossary	11
Acknowledgments.....	13
Dangerous liaisons? Introduction	19
It's a man's world.....	20
Irrigation questions are feminist questions	27
Thinking gender (in irrigation)	32
Method and outline of the thesis.....	41
Missionaries and mandarins. Feminists making sense of irrigation	47
Irrigation, modernization and development.....	53
Feminist visions on (irrigation) development.....	66
Thinking gender in irrigation	76
Linking women to the main canal. Mainstreaming gender in irrigation?	87
Mainstream irrigation thinking.....	90
Seeing women in irrigation.....	107
Conclusions.....	120
A plot of one's own? Gender and irrigation in Burkina Faso.....	125
Irrigation in West Africa.....	127
The Dakiri irrigation system.....	135
Irrigation and gender relations.....	146
Conclusions.....	161
Free-riders or victims? Gender and irrigation in Nepal.	169
FMIS: Alternative (irrigation) development?	172
The Chhattis Mauja irrigation system	178
The intra-household organization of farming	182
Gender aspects of irrigation management.....	189
Conclusions.....	200
Struggles over resources and meanings. Gender in Andean irrigation.....	207
Gender discourses in the Andes.....	210
Gender dimensions of water control	215
Discourses, truth and politics	235

Wedlock or deadlock? Conclusion and discussion.....	241
Straddling boundaries, changing metaphors	243
The politics of feminist irrigation knowledge	250
Seeing, representing, managing, controlling.....	254
References	259
Annex. Methodology of Burkina Faso and Nepal case studies	289
Summary	291
Samenvatting.....	297
Curriculum Vitae	303

Tables and figures

Figure 3.1	Inputs and outputs: irrigation in the context of nested systems	104
Table 4.1	Main features of the Dakiri irrigation system	135
Figure 4.1	Location of the Dakiri irrigation system	136
Table 4.2	Different fields and their characteristics	140
Table 4.3	Number of 'woman's days' as compared to the number of days contributed to the collective field	141
Table 4.4	Plot ownership in Dakiri	149
Table 4.5	Labor allocation to male plots	153
Table 4.6	Labor allocation to female plots	154
Table 4.7	Agricultural productivity of irrigated plots in T/ha	158
Table 4.8	Agricultural productivity of male plots per category of plowholder in T/ha	158
Table 4.9	Use of irrigated crop production, male and female plots in kg	159
Table 4.10	Use of the income of irrigated plots	160
Table 5.1	Possible cropping patterns in the Chhattis Mauja command area	179
Table 5.2	Cropping patterns per type of household, Purbi Shankar Nagar	184

Acronyms

BBC	British Broadcasting Corporation
CGIAR	Consultative Group on International Agricultural Research
CONAIE	Confederación de Nacionalidades Indígenas del Ecuador
CROPWAT	A decision support system to calculate crop water and irrigation requirements
DANIDA	Danish International Development Agency
DGIS	Directoraat Generaal Ontwikkelingssamenwerking
DISC	Department of Irrigation and Soil and Water Conservation
FAO	Food and Agriculture Organization
FMIS	Farmer Managed Irrigation System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
GWA	Gender and Water Alliance
GWP	Global Water Partnership
ICID	International Commission on Irrigation and Drainage
IFPRI	International Food Policy Research Institute
IHAV	International Information Centre and Archives of the Women's Movement
IIMI	International Irrigation Management Institute
IWE	Irrigation and Water Engineering Group, Wageningen University
IWMI	International Water Management Institute
PMI	Projet Management de l'Irrigation
RAF	Reorganisation Agraire et Foncière (Burkina Faso, 1984)
SCOT	Social Construction of Technology
SNV	Netherlands Development Organization
USAID	United States Agency for International Development
WALIR	Water Rights and Indigenous Rights
WID	Women in Development
WUA	Water Users' Association

Glossary

Burros	(Spanish) Donkeys, used for transportation
Canteros	(Andes) Spiral-shaped irrigation furrows on steep slopes
Champs bas fonds	(Burkina Faso - French) Low-lying humid soils
Champs de brousse	(Burkina Faso - French) Collective male-controlled family fields where millet and sorghum are grown
Champs de case	(Burkina Faso - French) homegardens
Champs dunaires	(Burkina Faso - French) Collective male-controlled family fields where millet and sorghum are grown
Chef de terre	(Burkina Faso - French) Earth priest or land chief who has the authority to decide about the allocation of lands to community members
Dedano	(Burkina Faso) Male head of the (extended) family
Ejidatarios	Members of Mexican land collectivities
Faenas	(Andes) Collective working parties, for instance for constructing or maintaining irrigation canals.
Femmes libérées	(Burkina Faso - French) Literally: liberated or freed women, older women who do not have any children anymore for whom they are responsible. They are freed from the work in the collective family fields.
Gestion de terroir	(Burkina Faso - French) Literally: Land management - referring to a particular integrated development approach
Kamanyango	Female controlled individual fields in the Gambia (cf. Carney)
Kulara	(Nepal) An irrigation share, assigned to a member village in the Chattis Mauja, and also the irrigation rights and labor obligations of that village.
Machismo	(Andes) Refers to a prominently exhibited or excessive masculinity, ranging from a personal sense of virility to a more extreme masculism. Mostly associated with conservative ideas about gender roles, and with beliefs in the superiority of men over women.
Marianismo	(Andes) Female equivalent of <i>machismo</i> , expressing and idealizing 'feminine' characteristics such as emotional, kind, instinctive, whimsical, docile, compliant, vulnerable, and unassertive. Usually associated with ideas that 'a woman's place is in the home'.
Maruo	Male controlled family land in the Gambia (cf. Carney)
Mauja	(Nepal) Village

Meth Mukthiyar	(Nepal) Main system irrigation messenger, person responsible for conveying messages from the leaders of the irrigation organization to the villages, and vice versa.
Mingas	(Andes) Collective working parties, for instance for constructing or maintaining irrigation canals.
Mukthiyar	(Nepal) Village irrigation leader
Pagnes	(Burkina Faso - French) Clothing
Regidor	(Andes - Peru) Canal operator
Reginas	(Andes - Peru) Water distribution meetings in the field
Usos y costumbres	(Andes - Spanish) Uses and customs, implying local norms and rules.
Warabandi	A rotational method for equitable allocation of the available irrigation water, practiced in Pakistan and North India

Acknowledgments

Upon finalization of this thesis project, I find it difficult to precisely establish where and when it started. This is not because of the failing memory that comes with old age, but because the contours and objectives of the thesis have tended to shift with every next step, and with every new insight. The broad theme of gender and irrigation has been with me since I studied for my MSc in Wageningen in the 1980s. The roots of the thesis can therefore be said to lie there. Since then, the thesis more or less logically evolved from and alongside my work as a researcher and teacher on this theme. It never was the separate and clearly bounded project that it should have been when envisaged from perspectives of efficiency or normalcy. For a long time, I considered the thesis as a sort of luxury resort removed from the more prosaic everyday logistics and politics of working life. Every once and a while, I retreated into this resort and enjoyed its space and time to more freely explore and reflect on the gender and irrigation questions I had come across.

As the work progressed, I slowly realized to what extent discovering truths is about communication rather than just about uncovering layers of realities from an isolated and unattached position. The unarticulated ambition which with I started the thesis also had to be revisited and reformulated in the long course of its development. When I began, I more or less hoped that an epistemological rigor would carry me through, that the book would become an all-encompassing synthetic argument about feminist visions on irrigation and its philosophical and ideological underpinnings. Yet, as I went further along the road of producing this thesis, the thing grew longer, looser, more speculative, and, I believe, more honest. Ambiguities intruded that fit no scheme and I let them stand as questions.

The thesis is a visible sign of an extended web of colleagues, friends (human and animal), and students. It is not possible to acknowledge all the gifts of ideas, time, inspiration, jokes, references, shared passions, poetry and language, commitment, food, money and much else that I have received from the networks of beings that have contributed to the development of this final product. I nevertheless want to try to name a few.

Most of the fieldwork for the Burkina Faso study presented in chapter 4 was done by Clarisse Zoungrana, who had earlier done field research for her MSc about gender and irrigation. Clarisse was a great source of knowledge and feminist inspiration, and I thank her for her insights and dedication. Hypotheses for the Burkina Faso study were importantly inspired by Clarisse's earlier work, but also by the studies done about gender and irrigation in Niger, by Fatima Dadi Massalachi and Kongo Gbatiene. Mirjam Schaap used the results of these studies to carry out further research and test some ideas about the linkages between gender and irrigation management in Saga and Tillakaina. It was a privilege to work with Fatima and

Mirjam, and I thank both of them for sharing their insights and enthusiasm with me. When conducting the field study in Burkina Faso, I spent quite some time discussing my ideas and findings with Nynke van der Zee, who at that time worked with SNV in Burkina Faso on gender and irrigation. I also thank Nynke for opening her house to me when I was in Ouagadougou, and for taking me along to a memorable celebration of the Dutch Queen's birthday. The directors of the IIMI West Africa offices at that time, Hilmy Sally and Kurt Lonsway, were crucial in making the gender studies possible. Their support and enthusiasm for the studies was refreshing and important. The Nepal and Burkina Faso studies were made possible through financial contributions of the governments of the Netherlands (DGIS/DST/VR) and Danmark (DANIDA) to IIMI's gender program.

For the Nepal study of chapter 5, Nita Neupane did most of the fieldwork. Working with Nita was a joy of mutual discoveries and learning. I thank the Winrock Foundation in Kathmandu for releasing Ms. Bijaya Bajrachya and Ms. Utpalla Pradhan to assist with data collection during the survey part of the fieldwork, and Bijaya and Utpalla for their enthusiasm and commitment. The development of the research proposal and methodologies for the Nepal study benefited from the help of Ms. Jyothi Tuladhar, Executive Director of the Center for Women and Development in Kathmandu. Ujjwal Pradhan, who was working for IIMI (International Irrigation Management Institute) in Nepal at the time of conducting the study, was instrumental in many of the logistical and administrative matters, and also provided important intellectual insights. I thank Ujjwal most of all for his confidence and enthusiasm: at the time (in 1993/4), he was one of the very few people at IIMI who were convinced of the need to do gender research, and who was willing to take initiatives in this direction. His support was crucial. Bert Bruins and Annelies Heijmans both worked for SNV (Netherlands Development Organization) in Nepal when I first visited the country to explore possibilities for doing research there. They were just finalizing their own research on gender and irrigation, the results of which importantly framed my own initial ideas. The workshop on gender and irrigation they organized provided a neat opportunity to get to know people and ideas about the theme in Nepal. During my first visit, Bert and Annelies also opened their home for me, and took much time and effort to show me around and help me understand Nepal. I thank them both for their ideas and for their hospitality. When re-writing and re-visiting the results of the Chhattis Mauja study for the purpose of this thesis, Suman Gautam and Pranita Bhushan Udas both commented upon drafts and shared their insights about Nepali society with me. Suman did her own PhD research in the same area. Pranita even went as far to check my statement that 'head-end women were stealing water' - which had provoked some discussion among Nepali water professionals - with the president of the Chhattis Mauja Water Users' association (he confirmed it). I feel grateful to continue to have the possibility to work with and among such bright and inspiring people.

The chapter on gender and irrigation in the Andes has largely come about through, and because of, my friendship with Rutgerd Boelens. Through his enthusiasm he managed to overcome my initial reluctance to wander into yet another part of the world. Over the last five years, we have spent many inspiring hours together thinking and reflecting about questions of ethnicity and gender in irrigation development and water policy in the Andes. Rutgerd's persistence and enthusiasm has been important to me, in more than just a professional sense. His unfaltering belief in the possibility to change this world into a better place is a source of comfort. The trip to Ecuador, and the many inspiring people Rutgerd introduced me to in Quito and Riobamba, also re-nourished my own belief in better futures. I also thank Rutgerd for agreeing to use part of our collaborative work for a chapter in the thesis, and for spending time and energy to turn this chapter into what it has become. I thank Rhodante Ahlers and Juana Vera for their comments and suggestions on earlier drafts of this chapter, and Zulema Gutiérrez for inspiring discussions on the differences between 'feminist' and 'andeanist' discourses.

Much of my understanding of 'normal professionalism' in irrigation is based on the time (1992-1998) I worked with IIMI (now IWMI). I am grateful to my colleagues of that time for intellectual exchanges, for critical provocations and sharp questions and for guidance and support. Although it was tiresome and often frustrating to continuously having to defend the importance of gender, and of having to explain what gender is about, it is through these queries that I have come to learn and understand the professional irrigation mind-set. Without forgetting all the others, I would like to particularly mention the head-office crew with whom I had most exchanges, mostly during informal lunch discussions: Doug Merrey, Chris Perry, Madar Samad, Sam Johnson, Jacob Kijne, Paul Gosselink, Hammond Murray-Rust, Charles Abernethy, Wim Kloezen and Doug Vermillion. Zenete Franca has been important in another sense: I am not sure whether I would have survived the first period at IIMI without her. I would also like to especially thank the 'Sri Lanka gender team', or 'the girls' as Kusum used to call them: Prianthi, Padma and Renuka.

Since the time we studied together, Eva Jordans and Rhodante Ahlers have been important co-travelers and friends on the road of discovering gender and irrigation realities. I thank them for feminist inspiration and solidarity. Others who have walked with me on parts of this road are Mirjam Schaap, Kusum Athukorala, Ruth Meinzen-Dick, and Antoinette Kome. I have enjoyed the walks together, and thank them for companionship and ideas.

Kalunde Kissawike, Pranita Bhushan Udas and Juana Vera Delgado, all three doing their PhD research on gender and irrigation, have been important sources of new inspiration and ideas. All three of them are incredibly courageous women whom I deeply admire, and I feel proud to know them and work with them. They helped and help me stay in touch with irrigation realities 'in the field'. The experiences and

work of some MSc students have also been important in this respect. I would like to particularly thank Marieke den Hollander, Nuru Mziray, Rose Machiridza, Jean Kamwamba, Khadouja Mellouli, Riti Herman-Mostert, Janwillem Liebrand, Nynke Post-Uijterweer and Marjolein de Jong. I thank Karen Vintges for reading and commenting on a first draft of the first two chapters. Her positive feed-back was very welcome at a moment when I was about get lost in the more philosophical and epistemological territories that I had wandered into.

While writing the thesis chapters, I have greatly benefited from the encouragement of my colleagues at the Irrigation and Water Engineering Group at Wageningen University. I thank Joost Oorthuizen, Rutgerd Boelens, Alex Bolding, and Flip Wester for reading drafts of several chapters and versions of the thesis, and for providing insightful comments, suggestions for improvements and, perhaps most importantly, for 'positive reinforcement'. Alex and Flip are true comrades and thinking partners; I remain in awe of their intellectual creativity. Joost deserves special mention for having, sometimes rather fiercely, convinced me of the need to get the thesis project on the road and organized, to turn it into a manageable and doable project. As part of a PhD support group, Gerardo van Halsema, Edwin Rap and Peter Mollinga were among those who provided feed-back and advise at various points in time: thanks to you, too.

Of-course, I want to especially thank Linden Vincent who, as my supervisor, has been instrumental in carrying this PhD project through. The whole IWE working atmosphere has been a pleasant and supportive one, even though it often proved difficult to prioritize thesis work over other more seemingly urgent or directly rewarding activities. In addition to those whom I already mentioned, thanks to Kai Wegerich, Frans Huibers, Gerrit van Vuren, Jeroen Warner, Harm Boesveld, Jaime Hoogesteger, Bernita Doorenbos, Gerben Gerbrandy and Bert Bruins and for all the visiting PhD students to help create an intellectually stimulating and warm environment. Special thanks to Trudy Freriks, Gerda de Fauw and Maria Pierce, without whom the whole group would fall apart and little, if any, work would actually get done. I feel lucky to be working amongst such a nice group of people, and hope to continue doing so in the coming years.

The long involvement in such a time-consuming and self-absorbing activity as the writing of this PhD thesis has had a deep impact on my sense of self and on the way I relate to others. There are a number of people who have been important in trying to safeguarding my sanity. In this regard, I would first like to mention Hette en Geery, my parents, whom I thank for not just unconditionally believing in the talents of their daughters, but for also proactively stimulating our ambitions to live the dreams we still share. Thanks to Ellen, my sister, for dangerously being my mirror and alter ego, and for always providing a sense of wholeness. For being the only woman I

would want to be if I had to be one. Thanks to both Ellen and Imke, my other sister, for belonging to similar histories, for sharing joys and sorrows, for madness and fun.

Robert Smit, Erik Heijmans, Marianne Cense and Anne Lever form and have formed, as it were, my most direct home environment. Manon Tiehuis has been an equally important member of this home environment for quite some time. I thank Robert of-course for having designed the cover of this book, but more importantly for laughs, creativity, intellectual exchange, moral support and for significant otherness. Thanks to Erik, for sharing my angers and beliefs, for laughing about my seriousness about trivial matters, for putting everything in a slightly different perspective, for continuously emphasizing that I was and am wasting my talents and worshipping the wrong gods, and for - in spite of this - understanding me and trusting me. I thank both Erik and Robert for their efforts in providing a space "outside of this world".¹ Thanks to Manon and Marianne for well prepared meals, for endless conversations, for just sitting together on the couch, and for preventing me from going insane by literally forcing me to acknowledge that there is more to life than thoughts, and that emotions are not always (or maybe hardly ever) neatly or easily categorizeable in the moral and intellectual schemes of the mind. And thanks to Anne, for being the only other woman I would want to be if I had to be one. Or man, for that matter. Who cares? For patience, for gender trouble, for wisdom, for support and encouragement, and for having endured a highly unbearable and impatient version of me, not just during the ten weeks we spent together writing in Portugal, but also after that. New mountains to climb together are waiting for us, and new and wider views!

¹ "N'importe où! Pourvu que ce soit hors de ce monde!" (Baudelaire).

Dangerous liaisons? Introduction.

“Nature's work and women's work in water conservation has usually been ignored by the masculinist paradigm of water management which has replaced community control by privatisation, and water-prudent staple foodcrops by water thirsty cash crops.” (Shiva, 1989).

“What are the main reasons that so few women are employed in the irrigation offices and so few are studying to become irrigation engineers? – The reason is that the labor of irrigation is not suitable for women, and women have to look after their children, husband and the household.” (Interview with male staff member at the Provincial Agriculture and Forestry Service Office, Lao PDR, cited in Schenk-Sandbergen and Choulamany-Khamhoui, 1995:25).

Irrigation projects have a very poor reputation among feminists. The most striking examples of how development projects negatively affected women and gender equality are examples from irrigation projects. Many feminists have, in a logical reaction, come to seriously dislike and mistrust Irrigation Engineers¹. This book starts from a similar mistrust. However, this mistrust is not so deep as to think, as some feminists do, that irrigation and gender equality are an oxymoron, a

1 An engineer can be defined as “a provider of solutions to the technological needs of society” (Open University, 2005). I write ‘Irrigation Engineers’, with capital letters, to denote a symbolic Irrigation Engineer rather than any actually existing irrigation engineer. The symbolic Irrigation Engineer represents ideal-typical representatives of what Chambers has described as Normal Irrigation Engineering (see Chambers, 1988:72-76). One condition to be (seen as) a Normal Irrigation Engineer is to be a Man; professional normalcy in irrigation engineering is closely linked with normative masculinity (Cf. Connel, 1987 on hegemonic masculinity). Though most engineers do not meet the normal professional and masculine ideals, and though some may even actively reject and resist those, they do serve as referential standards against which professional quality is measured or discussed.

contradiction both in terms as well as in practice. On the contrary, this book presents an attempt to reconcile the feminist indignation about irrigation realities as it came across in studies produced in the 1980s with a professional commitment to the irrigation world. The attempt at reconciliation has been and continues to be a project full of ambiguities. Encounters between Feminists and Irrigation Engineers often have the character of dangerous liaisons, threatening to shatter established professional identities and doctrines and involving political and analytical dilemmas, paradoxes and uncertainties.

In this first chapter of the thesis, I sketch the contours of my project and introduce the rest of the book. In the first section, I start with explaining the book's rationale by giving a brief expose about how irrigation is, in more than one sense, a man's world. Unlike some feminist scholars, I do not consider this masculinity as a given, but see it as a historically specific social and discursive construction. Showing that this is so, and challenging the conventional ways in which irrigation is conceived and defined is the red thread of the book. I use the chapter to explain the book's main quest, that of making women visible in irrigation and of allowing gender as constitutive of irrigation realities. I describe what this project entails in terms of politics and knowledge, and discuss some of its inherent paradoxes and tensions. I continue with explaining the book's genesis, and show how my own experiences of trying to get gender on irrigation agendas shaped my thinking about feminist knowledge production. In the second section, I proceed with an introduction and discussion of the book's most important theme: gender. I also elaborate on methodological and epistemological questions that have guided my search for gendered irrigation knowledge and that have informed my attempts at knowing gender in irrigation. I end the second section with locating some important entry-points for (re-)conceptualizing irrigation realities that allow seeing and thinking gender, and that make female protagonism in irrigation possible. The first chapter concludes with a section in which I present the book's outline, and in which I provide some further background to how its contents were produced in terms of research context and method.

It's a man's world....

Mentioning 'women' in a professional irrigation context is much less of an anomaly than it used to be in the seventies and eighties of the last century, and before. Numerous texts have been published about gender and irrigation, and a large number of studies on the topic have been conducted. International conferences about water (such as the World Water Forums held in 2000 and 2003, or the International Conference on Freshwater Resources held in Bonn in 2001) mostly include special sessions, publish special documents² and organize keynote addresses about gender.³

2 See the various web-sites of these events. Two documents that were produced for the World Water Forum in 2000 are IIAV, 2000 and World Water Council, 2000. At the Bonn Freshwater Conference,

The statements and documents produced at the occasion of these conferences are sprinkled with references to 'women', and may even have special sections about gender. Most water policy documents likewise often make explicit mention of women, and most donor funded irrigation projects have explicit gender components. Often at the initiative - some would say under pressure - of donors as well, public irrigation departments and ministries in some countries (Egypt, Ethiopia, Nepal, Yemen) are developing their own in-house gender expertise or gender units. In spite of (or maybe thanks to⁴), the fact that gender and women have now earned a legitimate place on water policy agendas, the irrigation world continues to be masculine. The masculinity of irrigation can be exposed in three different 'worlds' which are linked, although not in direct causal ways. A first world is the world of the irrigation system, where female and male irrigators and farmers use water, irrigate, farm and organize their livelihoods, and where operators and managers distribute water, maintain the infrastructure and resolve water related conflicts. The second world is the world of thinking about irrigation and the world where representations of irrigation realities are produced, and the third world is the world of professional irrigation cultures and identities. In what follows I further describe these three worlds.

The first world: rights and voice

The first irrigation world can be characterized as masculine primarily because rights to irrigation water and infrastructure and rights to irrigated land, almost everywhere in the world, continue to be predominantly vested in men. Female irrigators and farmers, almost everywhere, have significantly fewer possibilities to own irrigated land and water than male irrigators and farmers do.⁵ Although women often are important providers of labor to irrigated agriculture and to canal maintenance and cleaning, they often do not directly control the fruits of their work. This partly explains why women's irrigation work is typically less rewarded than men's irrigation work in the sense that women benefit or gain less from their efforts. Women are also typically less involved in water users' associations. Membership of such associations tends to be reserved to men, and participation in public meetings is

and again for the Third World Water Forum of 2003, new documents were produced and evidence gathered. Some of these efforts are coordinated by the Gender and Water Alliance, the existence of which is itself can be seen as testimony of the fact that gender has conquered a legitimate place on international water policy agendas. See GWA, 2003a and 2003b and Maharaj, 2003. Also see the GWA website, <http://www.genderandwater.org>

3 See for examples of such key note addresses: Francis and Jahn, 2001; Schreiner, 2001

4 Some would argue that the easiest way to neutralize feminist concerns is by placing them in a separate section, or under the responsibility of a separate expert, so that they can be kept isolated from the main concerns. Words such as 'side lining', 'co-optation', and 'lip-service' express this argument. While I agree that such a mechanism is often at work, I do not agree with the suggestion of a purposive strategy to draw feminist's teeth.

5 Exceptions include Tanzania (Mziray, 2004; Sheridan, 2002).

often seen as an activity that is clearly linked to masculinity.⁶ As a result, women often do not have a formal voice in decision making and do not have the same possibilities for influencing choices about the mobilization of resources for maintenance or about water distribution as men do.

The very activity of irrigating is often seen and labeled as distinctly masculine. Irrigation is not something that just men do, but also something that culturally belongs to the male domain and that is associated with masculinity. In Pakistan, some women were offended when asked if they were involved in irrigation (Basnet, 1992). In Nepal, 'irrigation' is conceived as the limited set of activities related to the maintenance of the head works and primary canals. Although irrigation obviously involves many more activities, defining it in this way makes it possible to claim that irrigation is a male activity (Benda-Beckmann et al, 2000). Likewise, in Peru "women who prepare meals for workers and bring *burros* as transportation between the fields and town, perceive these tasks as part of an integrated whole called 'irrigation'. In fact, women speak directly of being involved in irrigation when they carry out tasks that complement men's work in the fields. Men, on the other hand, more narrowly define irrigation as the work they perform in actually opening the channels with shovels to that water flows into the fields" (Bourque and Warren, 1981:119). In a Mexican irrigation system in the Lerma-Chapala basin, positions of leadership in water users' organizations are culturally defined as masculine, with the exercise of power and authority as being seen as reserved for those who best embody and perform versions of hegemonic masculinity (Monsalvo-Velázquez and Wester, 2002). In Andean irrigation systems (Radcliffe, 1986) as well as in Sri Lanka (Athukorala, pers. com.) and in Tanzania (Upperman, 2000; Sheridan, 2002), the demarcation of irrigation as a masculine domain is couched in gender symbolisms that are linked to taboos and myths that stipulate that women are not to come close to irrigation intakes, or to walk on canal bunds. If they do, disasters in the form of collapsing intakes and reduced fertilities of soils and women will be the result (Sheridan, 2002; Radcliffe, 1986).

The second world: thinking about irrigation

The second world, the world of thinking about irrigation, is a man's world in that irrigation narratives have long de-valored women's contributions or rendered thinking and speaking about women irrelevant. Most contemporary irrigation texts are no longer overtly sexist, for instance in preaching in favor of a specific gender division of labor based on the explicit positing of differences between the capacities of women and those of men or by connecting women with the bodily work of reproduction and domestic labor. Yet, most current discursive interpretations of

6 Efforts to redress the male dominance of water users' organizations happen throughout the world. In Nepal, and possibly in other countries as well, a quota system has been introduced to guarantee a minimum involvement of women in water users' associations. See Bhushan and Zwartveen, 2005.

irrigation realities do typically emphasize and attach greater value to those activities and experiences that are associated with men or with masculinity. Although many current writings adopt a gender neutral approach that appears to include women as irrigation actors, their subtexts continue casting such actors on a masculine mould. It is telling that in discussing the absence of women in their writings, many of my professional irrigation colleagues claimed never (or seldom) to have come across women irrigators in the field. Others said they believed that female actors in the 'first' irrigation world were not influential in shaping irrigation realities; according to them the 'real' work and decisions were done by men. One of the few irrigation engineers to reflect upon this in writing is Pushpa Khanal: "Once two USAID officials, on a mission to the project, asked me why there were no women in the WUA. I had never thought about the question nor had an answer. But from my own perception, I told them activities and system maintenance are likely to be a male job." (Khanal, 2003:233). As Khanal also notices, the very fact that it is mostly men who own irrigation land and have rights to water, together with the dominance of men in water users' organizations (a reality that itself can be seen as partly the product of gender biased irrigation thought and planning) legitimizes the neglect of women and gender relations by irrigation professionals.

The various and numerous irrigation activities that women do are not only not seen, but they also have gradually come to be defined as 'non-irrigation' - in the sense that they are considered irrelevant to the irrigation profession - and even as 'non-professional'. When women are cleaning canals or irrigating, they are seen and said to do so on behalf of their husbands, who are the 'real' irrigators and farmers. With some notable exceptions, irrigation texts tend to limit the identification of important irrigation actors to those individuals who have a functional (and often formalized) link to the irrigation system, as office-bearers in water users' associations or as employees of irrigation departments. Those who study irrigation politics likewise tend to define politics as that what men do, often adopting rather than critically investigating what different actors themselves perceive as influence and power - perceptions that may be gendered for instance in the fact that overt display of force and political influence is appreciated much more in men than in women, prompting women to use less conspicuous ways of getting what they want and influencing decisions. Slightly exaggerating, it is almost as if irrespective of *what* women do in irrigated farming or irrigation, the very fact that it is a woman doing the job is enough to qualify it as 'non-irrigation'.

Women are not just misrepresented as direct actors in irrigation thought. Gender concerns also tend to disappear into the background because of the ways in which irrigation professionalism normally organizes reality: Questions of gender tend to either touch on what is considered as 'natural' or as 'instinct', delegating it to the disciplinary realms of biology or psychology that are relatively far from irrigation. Alternatively, gender questions are seen as derivative of larger technical, social or economic developments that do not require separate study. In most professional interpretations of irrigation realities, gender relations and identities do not belong to

the domain of what needs to be explained, but are taken for granted. And at an even deeper level, questioning gender within irrigation thought is difficult because existing ways of speaking, writing and thinking about irrigation realities tend to inherently pre-suppose and are built on a hierarchical (social, biological or psychological) dichotomy between women and men. This dichotomy is associated with familiar conceptual and symbolic distinctions such as the ones between production and consumption, between private and public, or even between reason and emotion or nature and culture, which provide the invisible foundations for many theories on the functioning and management of irrigation systems.⁷ A final barrier to seeing women and questioning gender in irrigation thinking is the fact that the traditional subject matter of irrigation engineers is non-social: soils, plants, water, and technology. Although insights from social sciences are increasingly incorporated in irrigation narratives, the legacy of epistemological positivism remains visible in the general absence of critical reflection on the social construction and influences of irrigation designs and conceptualizations. This absence of a critical interpretative tradition of knowledge seeking makes inquiries about gendered meanings, identities and structures difficult (cf. Harding, 1986:33-34).

The third world: irrigation as a profession

The third irrigation world is male in the sense that the professional irrigation domain is heavily male dominated. This is most obvious in the fact that most irrigation professionals are men. However, and maybe less directly obvious, it also shows in the fact that the professional involvement with irrigation, be it as an engineer, manager or planner, is very much identified and perceived as a male activity, or as an activity belonging to the domain of men. Lynch (1993), as one of the few to reflect on the gendered-ness of the irrigation profession, argues that the characteristics and culture of the 'bureaucratic tradition' to which irrigation institutions and policies are tied is one that strongly associates decision-making and power with masculinity. As she argues, the hegemonic strength of this tradition has long been maintained, and to some extent continues to be maintained, through the socialization of generations of engineers and bureaucrats. It finds legitimization in the powers and financial resources of irrigation bureaucracies (or *hydrocracies*, see Rap et al., 2004). Through the 'bureaucratic tradition', masculinity and the professional irrigation identity have come to belong to each other; they mutually constitute and define each other at symbolic and metaphorical levels. This means that the irrigation profession and the professional status of those working in the field

7 As feminist philosophers have shown, the ontological distinction between soul (consciousness, mind) and body invariably supports relations of political and psychic subordination and hierarchy. The mind not only subjugates the body, but occasionally entertains the fantasy of fleeing its embodiment altogether. As a result, any reproduction of the mind/body distinction requires critical reflection as regards the implicit gender hierarchy that the distinction may produce, maintain or rationalize.

of irrigation are partly delineated through a gender demarcation. Attributes and skills that are seen as typical characteristics of good irrigation professionals - such as technical competence, physical strength, being in command, self-confidence, and rationality - are normally seen as characteristics more commonly found in men. This association of irrigation with masculinity draws from a wider system of sexual stereotypes which identify men with culture and women with nature and intuition.⁸ While the norms and expectations of what an ideal Irrigation Engineer should be change with time and also partly depend on the particular country of work and on the specific 'irrigation school' to which He belongs, Irrigation Engineers almost invariably embody some version of masculinity.⁹

One such version - one that I suspect of having influenced early generations of Dutch and British Irrigation Engineers - is that of a pioneering colonial hero who courageously designed and constructed large water control and irrigation works and who was not afraid of getting his feet in the mud and rolling up his sleeves to get the work done. This Irrigation Engineer was a typical Faustian figure, and a hero of modernity, wanting to understand and control everything in a desire for the all encompassing knowledge that were until then reserved to God. He aspired to be the creator of the world, the motionless mover who set everything in motion and the restless energy that kept everything going. He existed because he acted and because he produced the world through his acts the world was there for him. Stories about British colonial engineers working in India, like Sir Arthur Cotton, William Willcox, and Scott-Moncrieff provide ingredients for such a picture. These British engineers maintain a glorious existence in the memories of today's irrigation engineers but also in statues raised in their honor at the intakes of the irrigation systems they originally designed. The first Dutch colonial engineers were likewise remembered as heroes: "Engineers were involved in a heroic struggle to conquer challenging tropical water streams. They did this far away from home, in a deadly climate, and in circumstances that were also extremely harsh otherwise. Especially the pioneers among the builders of monuments were true heroes in the eyes of later generations of engineers" (Ravesteijn, 1997:7).

The account by Frank Westerman of the great marvels irrigation engineers were capable of bringing about in the former Soviet Union provides a rather similar version of the Irrigation Engineer (Westerman, 2002). These stories, just as Wittfogel's famous theory about the links between irrigation and state formation through centralized power (Wittfogel, 1957), suggest not just that there are strong

8 Following a psychoanalytic approach, the relationship between masculinity and technology in general, and technological warfare in particular, has been explained in terms of 'womb envy', whereby, in the words of Judy Wacjman, "men 'give birth' to science and weapons to compensate for their lack of the 'magical power' of giving birth to babies." (Wacjman, 1991)

9 It maybe significant in this respect that in some countries (like Egypt and India), a decline in the importance, power and budget of irrigation bureaucracies has, in recent years, gone accompanied with an increase in the number of female irrigation engineers and other water professionals in higher positions.

connections between power (or control) and irrigation (which is how the stories are usually read), but also lend further support to the hypothesis that these connections are supported by and grounded in ideological and symbolic notions of masculinity. To be an Irrigation Engineer equals to be in control and powerful, to be confident, which means being a man. There have been few (if any) studies that further explore why there is such a strong equation between masculinity and irrigation engineering, but the suggested connection between modern technology and hegemonic masculinity through links of control and domination has been a recurring topic in feminist technology studies.¹⁰

The extreme 'maleness' of the professional irrigation domain does not mean that irrigation professionals and the irrigation profession deny the existence of women altogether. Women, or the symbolically feminine, play a crucial role in lending irrigation professionals their virility: Women exist as lovers, mothers and daughters, roles that throw them into sharp relief with male Irrigation Engineers. Or: women are allowed a place in the irrigation world *as women*, as *the other* against which irrigation professionals in power define their projects. In one sense, the very absence and invisibility of women in the professional irrigation domain might be seen as contributing to the status of the irrigation profession by underscoring its 'manliness'. What Ruth Oldenziel describes for construction engineers in the U.S.A. may well apply to irrigation engineers, too: Engineers describe and perceive their world as an affair between men only in which women and their family of blood relatives are replaced by a family of engineers who prove their manhood through their struggles with other men, including fellow engineers, bureaucrats and politicians, and male farmers (cf. Oldenziel, 1999:119).

Connections between the three irrigation worlds

There are important connections between the three irrigation worlds, but these connections are not straightforward and directly causal. Mostly and importantly, the inhabitants of the three worlds are not the same people. Professional irrigation knowledge – the second 'world' – is most often not produced by irrigators, field operators and system engineers – the inhabitants of the first world – , but by those living in the 'third world': people outside 'the field', higher level managers, engineers and economists mostly, many of them forming part of an international brotherhood of irrigation professionals who meet and exchange experiences at international meetings. These professionals produce irrigation designs and management models that are strongly normative in their description of how the world *should* be. The final objective of many irrigation texts is to change the world, rather than to describe it. Much irrigation thinking, therefore, is not (just) an attempt at representing and ordering the world in words and numbers, but also involves spatial interventions in landscapes that significantly alter property relations, and

¹⁰ See for instance Faulkner, 2000, for an excellent review and a proposal for a research agenda on this issue. Also see Cockburn, 1985 and Oldenziel, 1999.

bring about new possibilities for accumulating wealth and power. In addition, representations of irrigation realities often serve to justify important investment decisions and distributionary choices, and also help determining how functions and powers within irrigation systems are defined and distributed.

As already mentioned, many of the people who are represented in irrigation narratives, - the irrigators and other inhabitants of the first irrigation world - are not involved in producing the knowledge about their lived realities. They also do hardly have any influence on the terms of their discursive existence. Itself a symptom of the now much criticized distorted accountability structures that characterize many irrigation management situations, irrigators' diverse perceptions and interpretations of irrigation problems do not normally serve to correct or alter those of the producers of truth statements about irrigation realities. In many ways, professional representations of irrigation are as much reflections of prevailing professional irrigation cultures (with their own configurations of power, status, authority and funds) as they reflect realities in the first irrigation world. Indeed, language, discursive practices and textual resources are part of a larger range of cultural resources through which irrigation professionals also and importantly represent themselves. How one speaks, thinks and writes about irrigation is also one way of constructing or re-affirming one's professional social identity, and of legitimizing one's professional activities and choices.

Irrigation questions are feminist questions

To some scholars, the masculinity of the irrigation world suggests that irrigation is somehow intrinsically masculine. They believe that irrigation is a clear symbol and manifestation of patriarchy at work, tied to and rooted in wider systems of male domination.¹¹ I reject this suggestion on various grounds, the most important one being that it rests on too essentialist a notion of gender, on the belief in universal forms of femininity and masculinity. I do not think that either irrigation or men are necessarily about control and domination of women and nature, and am more sympathetic to a view that appeals to an understanding of the social context within which particular gender constructions and particular irrigation technologies appear. This book's project starting point precisely lies in the feminist premise that the 'maleness' or 'masculinity' of irrigation is not the natural order of things, nor (necessarily) a reflection of the most desirable organization of the irrigation world. Rather, irrigation is and has been discursively, culturally and ideologically constructed as a male domain, technology and profession, thus providing it with a special status. Professional irrigation discourses - understood as particular truths

11 Vandana Shiva, for instance, reviles irrigation as a symbol and practice of masculinity and patriarchy, as is reflected in the following quote: "Taking water in large canals to arid regions to 'make the desert bloom' has been a particularly favorite masculinist project" (Shiva, 1989:192).

and representations shaped by specific conjunctions of knowledge and power – lend support to this construction by identifying appropriate and legitimate ways of practicing irrigation development as well as speaking and thinking about it (cf. Grillo, 1997:12). Showing that this is so, and in doing so challenging the conventional ways in which irrigation is conceived and defined, is an important part of what this book is about. The ‘gaps’ between the first irrigation world and the second irrigation world provide an important source for such challenges, as do visions of alternative feminist futures.

Below, I first introduce and describe my research question and focus. I then continue with an outline of the genesis of the book’s project.

Research question and perspective

The book’s focus is on *thinking* about irrigation, on what I denominated in the previous section as the second irrigation world. The central question to which the book formulates answers is:

“How to conceptualize irrigation realities in ways that enable recognition of gender as constitutive?”

The book’s focus on thinking about irrigation, on concepts, narratives and discourses, stems from the recognition that language and meanings constitute an important contemporary field of (feminist) politics and power. Feminist struggles importantly include struggles about the terms and languages used to define problems, struggles about the creation of discursive spaces to legitimately articulate and discuss questions of gender equity and justice, struggles about the power to define irrigation policy agendas, and struggles to open up conceptual and discursive possibilities for female protagonism in irrigation. Discourses exert power in the way problems are defined, interest groups labeled and, more generally, through the abstractions and simplifications by which they constitute the world. Recognition of such power does not imply suggestion of any direct causal linkages between thinking and practice, or between planning (or designing) irrigation systems and irrigation realities ‘in the field’. I am critically modest both about the influence of policy narratives in shaping the lives and practices of irrigators, as well as about the possible contribution an academic reflection such as this thesis can make to altering such narratives.

Although I thus reject too deterministic a view about the powers of discourse to produce and order realities, my conviction that the phrasing of water problems is important does provide an important justification for this book’s project. I already referred to the fact that representations of irrigation realities by engineers often do not serve the purpose of mirroring such realities as they are, but of painting a picture of how they should be, ideally. The possibility of making such projections of ideal worlds come true through interventions in land- and waterscapes forms an

important part of what justifies and fuels irrigation thinking. Even when such efforts often fail, irrigation thinking continues to provide the basis of important investments decisions, and often serves to scientifically or morally (with appeals to progress) justify far-reaching proposals for the (re-)distribution of land and water resources, for the re-ordering of society and for the 'normalization' and disciplining of people. In addition, the fact that the linkages between *thinking* about irrigation and irrigation *practices* and *realities* in 'the field' are weak is, I think, one of the symptoms of a problem of mis-representation, a problem that has its roots in the specific ways in which irrigation powers and knowledge are organized. As I explain in more detail below, increasing the possibilities to think about gender in irrigation intrinsically also includes thinking about ways of improving the representation of irrigators in irrigation discourses, of increasing their possibilities of self-articulation or of holding producers of knowledge accountable to their truth statements.¹²

Intellectually, the task of this book consists of questioning the conventional images of women and irrigation that are produced through various representational irrigation discourses, and by replacing them with 'new' images that are preferable both in that they better recognize the experiences and dilemmas of women and in that they better allow discussing questions of gender equity and justice. Proposing 'better' representations of irrigation realities comprises the simultaneous task of deconstructing the conventional terms and conceptual schemes that are taken to describe and understand irrigation. As I have argued above, while many current irrigation documents do allow for the possibility that irrigators are women, and while many increasingly mention women or gender or include a specific section on gender, as yet gender relations do not belong to the domain of what needs to be explained in irrigation. Gender relations are, at best, taken for granted. Yet, to qualify as 'feminist', what is at stake is not just recognizing and legitimizing existing gender relations, but problematizing and questioning them.

Shifting alliances

The writings in this book can be seen as a balancing act between engagement with the irrigation profession, and engagement with feminism. Many of its foundations were laid when I worked with the International Irrigation Management Institute (IIMI, now IWMI: International Water Management Institute) as a gender analysis specialist, between 1992 and 1998. My task consisted of initiating and developing a research program on gender and irrigation, something that at the time very few of

¹² I use the word 'discourse' quite loosely throughout the thesis to refer to 'ways of thinking' and 'systems of knowledge'. The definition of Gasper and Apthorpe, as used by Hilhorst in her thesis, comes close to my own use of the term: "an ensemble of ideas, concepts, and categories through which meaning is given to phenomena" (Gasper and Apthorpe, 1996:2, cited by Hilhorst, 2000:18). As Hilhorst continues to explain: "In this sense, the concept reminds one of the notion of paradigm, providing an intellectual framework for understanding phenomena. Discourses are more or less coherent sets of references that frame the way we understand and act upon the world around us" (Hilhorst, 2000:18).

my colleagues at IIMI considered important. I thus had to convince them of the importance of looking at and understanding gender relations in irrigation. My success in doing so importantly depended on 'speaking the right language': since I worked among irrigation professionals (engineers, economists and anthropologists from many different nationalities) and wrote mainly for an irrigation audience, I had to speak their language (or at least the language spoken at IIMI) to express feminist concerns in an intelligible manner, and to convey the importance of gender. I had to adopt the professional frame of reference of my colleagues, and express myself in the terms and concepts they used. My chances of success in gender advocacy were also crucially dependent upon the establishment of my own professional credibility, which I hoped to establish through learning and adhering to the vigilant professional code and culture. In my written thoughts I thus more or less consciously chose to remain committed to and firmly inscribed in the irrigation discourse as I understood it at that time at IIMI. As Diane Elson remarks for her project of linking feminism with macro-economic theories and policies, "[T]here is always a danger with this kind of engagement that one gets incorporated, and becomes an 'insider' oneself. From talking to the boys, one may become oneself 'one of the boys'." (Elson, 1998:156). I was conscious of this danger, but preferred running the risk of becoming 'one of the boys' to the one of social and professional isolation, with the resulting loss of communication possibilities and convincing power, which would have been the result of a position of greater disengagement.

With the gradual establishment of my own professional legitimacy within the professional context of IIMI, and with the growing acceptance within national and international professional irrigation networks of the importance of gender (or at least of women), the scope for greater detachment from mainstream thinking also increased and so did the possibilities for more critical reflection. This was fortunate, since I had gradually started to notice and feel that the irrigation language which I had adopted had serious and inherent limitations in recognizing and accommodating gender concerns. Issues of power, justice, domination and equity are difficult to grasp and analyze either within an engineering or irrigation management doctrine of which the main pre-occupation is 'to make the system work', or with the concepts borrowed from neo-classical welfare economics that increasingly penetrated irrigation thinking. Realizing this, my project gradually shifted from merely trying to prove the relevance and importance of gender, to thinking through the implications of dominant irrigation policy language for the possibility to recognize and understand that the irrigation world is a deeply gendered world. I, for instance, used feminist critiques of economic theories to think through the gender implications of new irrigation policies (See Zwarteveen, 1995, 1997 and 1998).

While working at IIMI, I was involved in a number of case studies in irrigation systems in Sri Lanka, Bangladesh, Nepal, Niger and Burkina Faso. The results of these studies further nourished my dissatisfaction about 'mainstream' irrigation discourses. There was an awkward discrepancy between mainstream discursive

representations of irrigation realities and the realities as I saw and interpreted them in different parts of the world. Fitting the experiences of male and female water users and farmers (as I observed and recorded them) in the molds proposed by irrigation professionals proved only possible when distorting them to such an extent that they became almost unrecognizable. This was not at all a new discovery. Many before me had argued and shown that most approaches to designing, planning and managing irrigation do not adequately conceive or accommodate the role of water users of either gender.¹³ The users of irrigation systems are “usually hidden inside design routines, described crudely through empirical factors that link them to inefficiencies, losses or uncertainties in system behavior” (Vincent, 1997b). Statements about water users’ behavior in irrigation texts are about how engineers and planners hope or wish irrigators to behave, rather than about observations and understanding of actual practices and experiences (Uphoff, 1986).

My growing unease with the political sub-texts and compromises implicit in the choice of certain analytical concepts and definitions of mainstream irrigation texts made me long for an intellectual environment that allowed and nurtured a more critical distance to mainstream discourses. The end of my time with IIMI in 1998 unexpectedly proved to be a lucky turn of events, because it made it possible for me to come back to my intellectual home, the University of Wageningen. In Wageningen, I enthusiastically embraced the opportunity to reflect upon my own thinking and writing endeavors of the past with the help of the enormously rich and varied body of feminist thinking that had been produced in the nineties of the last century. I avidly read and studied texts and books about feminism and science, feminist epistemologies, feminism and development, feminism and technologies next to indulging in more general works about democracy, gender analysis and the politics of knowledge production.

In the process, I nearly drowned in the swamps of post-modernism, with its declaration of the ‘death of the subject’ and its challenge to all truth claims. I was and am deeply conscious of how strongly my own ideas and beliefs are rooted in and form part of a project of modernism, and how they continue to be inspired by beliefs in progress and reason. I am likewise aware of how the feminist emancipation project is intrinsically a project of enlightenment. Yet, I was and am also sympathetic to many of the more critical perspectives on the possibility of progress, and of knowing (reason, science, and technology). Likewise, I have struggled to match the political need to firmly establish myself as a legitimate ‘knower’ who has the authority to convince others of feminist wisdoms with critiques of universalized truth claims and the centralization of knowledge. In the end, I have come to regard such tensions, paradoxes and controversies as central to my endeavors as reflected in this book. Maybe they are indeed, as Pearson and Jackson suggest in an introductory chapter on a volume about feminist visions of development, to be cherished and embraced as typical of feminist analysis: “Feminism in general may reject grand

13 See for instance Diemer, 1990; Van der Zaag, 1992, Scheer, 1996 and Mollinga, 1998

narratives and policies and approaches founded on essentialist and universalist notions of women's experiences and priorities; at the same time (...) it cannot fall back on a 'different places, different voices' position which evades the challenge of theorizing gender and development" (Pearson and Jackson, 1998:13).

Thinking gender (in irrigation)

What does it require to be able to meaningfully think about gender, and what does 'recognition of gender as constitutive of irrigation realities' entail? In this section, I draw the contours of my search for answers to these questions. The section starts with explaining the meaning of the concept of gender, a concept that was invented to dispute the biology-is-destiny formulation that is intrinsic to every-day speaking and thinking about men and women. In my definition and use of the concept, I emphasize what I like most about it: the fact that it allows questioning of what it means to be a woman or a man. To me, this possibility is what constitutes the heart of the feminist academic project. It logically follows that meaningfully 'thinking' gender in irrigation implies being able to conceive of irrigation realities in such a way as not to presume, preclude or naturalize gendered identities or structures, treating them as 'givens' rather than as that what requires explanation and questioning. In the second part of this section, I discuss what this implies in terms of 'knowing': is it possible to proclaim a truth about gendered irrigation realities if the objective is to continue questioning the meaning of gender? In the last part of the section, I make a start with outlining how such conceiving of, and knowing, gender can be combined with thinking about, and ways of conceptualizing, irrigation.

Gender

The distinction between sex and gender, between biological sex and social gender, is fundamental to today's feminisms. One of the slogans of feminism expressing this distinction is Simone de Beauvoir's famous phrase: "On ne naît pas femme, on le devient". The English sociologist Ann Oakley was the first to explicitly conceptualize the theme with two already existing words, gender and sex. 'Sex' is a biological term, 'gender' is a psychological and cultural one (Oakley, 1972). This distinction between sex and gender served the feminist wish of rejecting biological explanations of gender asymmetries, and it laid the foundation for the idea of 'gender' as a social construct. Gayle Rubin, in 1975, further unraveled the differences between the concepts of gender and sex. Every society, she argued, has a sex-gender system in which the biological basis of human sexuality and procreation is modeled through human intervention, through social intervention, so that the needs of this domain are taken care of in a conventional manner, however bizarre some of these conventions may be (Rubin, 1975). The argument to distinguish sex from gender is

not that biological differences between men and women do not matter, but that social relations between men and women cannot be explained by sexual differences as such. These have to be explained by the social usage and social meaning which is attributed to them and legitimized by their attribution as 'natural facts'. Rather than simply elaborating or expressing 'natural' differences, social processes – through a range of institutions, codes and taboos – mediate and modify biological differences and inscribe them in masculine and feminine gender identities (Rubin, 1975; Connel, 1985). Gender, therefore, is a concept developed to contest the naturalization of sexual difference in multiple arenas of struggle.

Joan Scott's work is useful in further refining the understanding of gender. Scott distinguishes between two important propositions the concept of gender entails. Gender is both a 'basic element of social relations', as well as a 'way through which and in which power obtains meaning' (Scott, 1986). Thus, gender is both an organizing principle of social life, creating and ordering relations between people in a hierarchical manner, as well as a process of giving meaning and obtaining legitimization. Harding (1986) adds one dimension of gender to this, that of identity. According to Harding, gendered social life is produced through three distinct processes: symbolism, structure and identities. First, gendered social life is the result of assigning dualistic gender metaphors to various perceived dichotomies that rarely have anything to do with sex differences (symbolism). Second, it is the consequence of appealing to these gender dualisms to organize social activity, of dividing necessary social activities between different groups of humans (gender structure). And third, it is a form of socially constructed individual identity only imperfectly correlated with either the 'reality' or the perceptions of sex differences (individual gender or gender identities). The referents for all three meanings of masculinity and femininity differ from culture to culture, though within any culture the three forms of gender are related to each other. These three forms of gender can together be seen to constitute what Rubin has called the 'sex-gender system', or what Connell (1987) calls 'hegemonic forms' of masculinity and femininity which constrain and influence the actual behavioral practices of men and women, but do not determine them. Instead, there are a range of possibilities between the *acceptance* of normative sanctions as the legitimate rules of behavior, and *conforming* to them (Giddens, 1979). In some societies, the rules and practices which shape gender relations are relatively flexible, leaving room for multiple interpretations; in others, they are severely and punitively enforced. Nevertheless, most societies display a proliferation of gender identities along with normative standards which exercise greater or lesser pressures for conformity.

The original reason for the concept of gender to see the light was the need for a distinction between nature and culture. Yet, in itself the concept does not transcend the dichotomy between nature and culture. On the contrary, it appears to reiterate the assumption that there is a biological essence which obtains significance and meaning through culture. The logical implication is that in gender analysis efforts biology and nature are either defined as the realm of the unchangeable, or they are

dissolved in culture and cease to appear in the kingdom of freedom. This is unsatisfactory, since people are not “Cartesian minds that happen to be located in biological matter in motion”, as Sandra Harding observed, but people are ‘embodied creatures’ (Harding, 1986).¹⁴ The dichotomous distinction between nature and culture is an ideological dichotomy, and not one which enables distinction of certain phenomena. People’s conception of what is natural and what natural differences consist of are cultural constructs, and form part of ways of thinking about gender that themselves need to be challenged. “Rather than marking a categorically determined pole, ‘nature’ or ‘woman’s body’ too easily means the saving core of reality distinguishable from the social impositions of patriarchy, imperialism, capitalism, racism, history, language. That repression of the *construction* of the category ‘nature’ can be and has been both used by and used against feminist efforts to theorize women’s agency and status as social subjects” (Haraway, 1991:135).

Questions about the linkages between biology and gender, and between ‘women’ and gender bring back the fundamental question asked by Simone de Beauvoir: Do women exist? Permanent awareness of this question is intrinsic to my own thinking as is reflected in this book. To put it more strongly: continuously having to ask the question about the meaning of gender and about what it means to be a woman or a man is what marks my academic feminist project. This means that I adopt a contextual conceptualization of gender that suggests that what the person ‘is’, and indeed what gender ‘is’, is always relative to the constructed relations in which it is determined (Butler, 1999; Scott, 1986). As a shifting and contextual phenomenon, gender does not denote a substantive being, but a relative point of convergence among culturally and historically specific sets of relations. Peeling of one layer or several layers of representations of women/gender does not automatically reveal a kernel, but only reveals yet more layers that articulate with each other, each of which construct and define men and women at times similarly, at times differently. Gender roles and relations are matters of controversy and debate, of continuous re-interpretation of meanings and practices (White, 1992). Men and women do not exist in some essentially pre-defined and a-historical categories. Rather, gender identities are worked out in society, and are constantly under

14 Of lesser relevance here is that through the feminist emphasis on the social side of the gender equation, the body is neutralized and denied any salience whatsoever. Taken to its logical limit, the distinction between sex and gender suggests a radical discontinuity between sexed bodies and culturally constructed genders. Gender becomes a free-floating entity with the consequence that “man and masculine might as easily signify a female body as a male, and women and feminine a male body as easily as a female one” (Butler, 1999:6). I consider such a deconstruction of the polarized terms into which bodily manifestations and behavior are forced as the ultimate aim of some forms of feminism (see for instance also www.continuum.nl). However, such forms of feminism are only of marginal importance to this thesis, and although I am deeply conscious of how even biology and the body are contested and constructed (see also Spaink, 1998), in this book I continue associating feminine and masculine genders more or less with ‘biological’ women and men, respectively.

negotiation and review. 'Femininity' and 'masculinity' appear under many different shapes and forms which are not reducible to underlying essences. Indeed, the very idea that there is such a thing as an essence of gender can be deconstructed as one of the power effects of language. Although nobody can escape from certain hegemonic gender notions and structures, people can, at least to some extent, shift and manipulate definitions of identity in accordance with contexts or interests.

Knowing gender, gendered knowledge

The feminist project of this book - that of making women visible in irrigation thinking - is a project of *representation*. In the words of Judith Butler: "On the one hand, *representation* serves as the operative term within a political process that seeks to extend visibility and legitimacy to women as political subjects; on the other hand, representation is the normative function of a language which is said either to reveal or to distort what is assumed to be true about the category of women" (Butler, 1999:3/4). This project of representation is based on one critical assumption: that of the existence of a category of women. These women not only require introduction and visualization within a discourse that denies or fundamentally misrepresents them, but also constitute the subject for whom political representation is pursued. Implicitly, women are thus thought to exist *before* entry into irrigation discourse, waiting to be recognized, 'discovered' and represented.

This assumption proves hard to maintain when adopting, as I do, a contextualized and relational conceptualization of gender. When gender is a relative point of convergence among shifting and diverse culturally and historically specific sets of relations, it becomes tricky, if not impossible, to denominate or represent *women* as a political category. Identifying a group of people that share important interests and needs by virtue of their shared position in society or by virtue of their shared identity is problematic, if social positions and identities are conceptualized as socially constructed and contextualized. The very question of what it means to be a woman, to belong to the category of women, is one to which the answer *by definition* depends on context and time. The assumption of the ontological integrity of the subject *before* entry into analysis, history and discourse thus falls apart, and prompts re-asking the question what women are, ontologically. *Who* are the women that require visualization and representation in irrigation discourse? And how can they be named without being, as yet, known? And if gender 'exists' in various partly overlapping layers of norms, rules, practices, religious customs and political ideologies that are socially and historically specific and constantly changing, then how to claim that one discursive representation of women is more valid than the other?

In my project, I have taken conventional irrigation discourses as a starting point. It is precisely the non-visibility or the absence of women in most mainstream irrigation discourses that defines, as it were, women in relation to irrigation. One could argue, following Simone de Beauvoir, that the feminine gender is marked as

the negative of men, the lack against which masculine identity differentiates itself; they are *the Other*. As such, only the feminine gender is marked in irrigation thinking, since the masculine is conflated with the universal person and thus does not require marking. Women are thereby defined in terms of their sex and men as the bearers of a body-transcendent universal personhood (de Beauvoir, 1964). One could also argue, following Luce Irigaray, that women constitute a paradox, if not a contradiction, within discourse and language. Within a language pervasively masculinist, a phallogocentric language, women constitute the *unrepresentable*. Within a language that rests on univocal signification, the female sex constitutes the unconstrainable and undesignatable. In this sense, women are the sex which is not 'one', but multiple (Irigaray, 1981). In opposition to de Beauvoir, Irigaray argues that both the subject and the Other are masculine mainstays of a closed phallogocentric signifying economy that achieves its totalizing goal through the exclusion of the feminine altogether. Women are not only represented falsely within the Sartrean frame of signifying-subject and signified-Other, but the falsity of the signification points out the entire structure of representation as inadequate. The sex which is not one, then, provides a point of departure for a criticism of hegemonic representation and of the metaphysics of substance that structures the very nature of the subject.¹⁵

When thinking through the implications of Irigaray's thinking one ends up in what Judith Butler calls the 'circular ruins of contemporary gender debate': if systems of thought and language become themselves suspect of being intrinsically masculinist (or phallogocentric), it becomes impossible to produce any truth-statement about women or gender (Butler, 1999) – because the intelligible articulation of ideas and thoughts can only be done from within and through existing languages and systems of thought. Hence, identifying the candidates for representation is not only difficult because the terms of the candidacy (what and who are the women that are to be represented?) are constantly shifting and depending on time and place, but also because these terms are dictated by the very discourses in which the question is asked. Indeed, the realization that the domains of political and linguistic 'representation' set out in advance the criterion by which subjects are formed means that representation is extended only to what can be acknowledged as subject. In other words, the qualifications for being a subject must first be met before representation can be extended. The implication for the project of making women visible to the irrigation profession is that the project itself seeks for a discursive and political formation that represents women as 'the subject' of 'irrigation feminism', and an effect of an enlightened feminist version of

15 Similar lines of reasoning have been used by deconstruction thinkers to discuss western representations of the non-west. Derrida, for instance, based on a critical reading of Lévi-Strauss illustrates how the invocations of the non-west in recent western critical theory is often employed as a rhetorical gesture to mark the limitations of western knowledge (Derrida, 1976). For the postcolonial critic Homi Bhabha this problem is part of western theory's "strategy of containment where the Other text is forever the exegetic horizon of difference, never the active agent of articulation" (Bhabha, 1994:31).

representational politics in irrigation. In simpler words, one could say that just as irrigation systems first imagine and then actively construct 'ideal irrigators' (see chapter 3) primarily by regulating the lay-out and distribution of land and water, but also through discursively constructing irrigation roles and functions, there is a risk that feminist versions of irrigation thinking 'produce' their own 'ideal women', dictating the terms people need to meet in order to become eligible for (feminist) recognition and representation.¹⁶

The ontological question of what gender *is* therefore closely linked to the epistemological question of how gender can be known and represented. If knowledge and texts (including this one) are themselves social constructions which do not simply mirror observable reality, but also actively create it, then how to judge various knowledge claims? My simple and short answer to this question is that asking for the most valid and accurate representation is asking the wrong question, since it continues to imply the possibility of knowing or discovering one (best) truth about gender. Elaborating this into a longer and more complex answer entails clarifying which grounds for justifying the validity of truth claims about gender I consider acceptable. My clarification has three important elements: Firstly, I am keen in preserving an empiricist-realist belief in a world that is independent of the knower. Secondly, however, I also emphasize the specificity of epistemic agents and the particularity of diverse cognitive circumstances, attesting to the influences of standpoint and postmodern thinking (Hartsock, 1998; Harding, 1986; Haraway, 1991). The deeply constructivist understanding of gender that I adopt fundamentally challenges classical empiricism, or the ideas that things can be known (at least in ideal observation conditions) by separate and interchangeable knowers whose specificities of embodiment and subjective location disappear in the process. Different feminist (and other) scholars have shown how produced knowledge always bears the imprints of the social and cultural values of communities of knowers (See for instance, Longino, 1990; Harding, 1986; Hartsock, 1998). And, thirdly, and faithful to my irrigation engineering background, my epistemology has a pragmatic 'truth is what works' element. Practical adequacy, therefore, is also one element of my knowledge test (see also Sayer, 1992), which is, of-course premised on a clear definition and inter-subjective agreement of what is accepted as adequate, and by whom.

In my thinking about possibilities of knowing, I am most inspired by the alternative to classical empiricism as developed by Donna Haraway, in a landmark article entitled "Situated Knowledges. The Science Question in Feminism and the Privilege of Partial Perspective" (Haraway, 1991). Haraway argues for 'situated knowledges' which maintain a strong commitment to objectivity – to learning to see well – while denying that everyone will see in precisely the same way. For Haraway,

¹⁶ Mohanty made this point for gender and development scholars in the eighties (Mohanty, 1991). Spivak likewise has argued that "varieties of feminist criticism and practice must reckon with the possibility that, like any other discursive practice, they are marked and constituted by, even as they constitute, the field of their production" (Spivak, 1988:225).

'seeing well' is not just a matter of having good eyesight: it is a located activity, cognizant of its particularity and of the accountability requirements that are specific to its location. It refuses to posit any subject/object split in the production of knowledge, insisting on 'the critical and interpretative core of all knowledge' (Haraway, 1991:191). In situated knowledge-making projects, embodied knowers engage with active objects of knowledge, whose agency and unpredictability unsettle any hopes for perfect knowledge and control.

This answer of how to deal with the 'subject question' demystifies the wish to provide truth claims in the strict positivist tradition as impossible, as a power move. It characterizes any effort to describe or represent the world, or even just the irrigation world, in one consistent all-encompassing narrative or discourse as politically dangerous (because of its totalizing and exclusionary effects) and academically suspect (because it hides the knower and her identity and power behind cloaks of objectivity). Likewise, and as I have shown, what women are (or what gender is) is also not thinkable in one consistent and universally valid definition. Depending on their objectives and dispositions, knowers can choose between different discourses, or eclectically 'pick' elements of a number of them. What matters is not only how well a particular discursive representation mirrors reality, but also how suitable a particular representation of reality is for the particular goals it serves.

This epistemological position critically redefines my project: the articulation of one new irrigation discourse that better represents women becomes untenable, since the criteria for judging which representation is best are specific to a particular time and place - and probably to a specific context of feminist struggle. Worse still, any theory or discourse that restricts the meaning of gender in the presuppositions of its own practice again sets up exclusionary gender norms. I think, therefore, that it is important not to idealize certain expressions of gender that, in turn, produce new forms of hierarchy and exclusion. I am particularly suspicious of those regimes of truth that stipulate that certain kinds of gendered expressions are false or derivative, and other true and original. I use these insights to reformulate my project as consisting of a critical genealogy of the legitimating practices of structures of irrigation knowledge and discourse. And its main task then would be to formulate - from within a clearly specified position - a critique of the categories of gender (identities, structures and symbols) that contemporary irrigation discourses visualize, naturalize, and immobilize. The objective of the thesis, in other words, is not to prescribe new ways of thinking and practicing irrigation that can be held up as a model for future feminist irrigation engineers and engineering feminists. Rather, with this thesis I hope to open up new possibilities for representing, realizing, articulating and questioning gendered identities, practices and meanings in irrigation.

Thinking irrigation

After having explained how I conceive of gender, and how I think gender can be known, it is appropriate to also spend some space on how irrigation can be 'thought' to allow meaningful incorporation of gender. As this is also the overall theme and quest of the book as a whole, I limit myself here to a brief outline of what I consider the most important foundations of a conceptualization of irrigation that is hospitable to seeing and questioning gender. More detailed discussions of what particular ways of conceptualizing irrigation realities entail for 'seeing' women and gender follow throughout the book.

The most important prerequisite for a conceptualization of irrigation that allows seeing gender is that it recognizes that irrigation is not just a technical, but also a social phenomenon. Attempts to theorize this recognition, and to use it for the development of a truly interdisciplinary ontology of irrigation, have formed one of the key challenges of the students and staff of the Irrigation and Water Engineering (IWE) Group of the Wageningen University. Since the 1980s they have been busy at attempts to transform a rather narrow agronomy and civil engineering perspective into a broader and more encompassing interdisciplinary approach which sees irrigation as a simultaneously technical and social phenomenon (Bolding et al, 2000; Mollinga, 1998; Vincent, 1997a). This transformation was not done in isolation from the rest of the world and reflected more general tendencies in thinking about and acting on water. Whereas the geographical and hydraulic focus of irrigation research and policy in the 1950s and 1960s was initially confined to field level, attention gradually shifted upwards against the flow of the water, arriving at main system level in the 1980s (Chambers, 1988), and at river basin and catchment level towards the end of the last century (Cosgrove and Rijsberman, 2000; Newson, 1997). At the same time the disciplinary focus of water research and policy broadened from an exclusive engineering and agronomy domain, to include sociology, economics, political science, management science, ecological science and others.

One important insight obtained by the IWE group in trying to recognize the social dimensions of irrigation was that it proved difficult, if not impossible, to simply 'mix and stir' different disciplinary approaches. The ways in which abstractions were made about reality differed too widely, different conceptual languages proved difficult to match, and data-sets were incompatible, often resulting in reports and documents that continued to be divided in separate disciplinary sections. Since the 1990s, efforts have therefore been undertaken to develop conceptual frameworks that are able to incorporate the physical/technical and social dimensions of irrigation simultaneously, as interrelated dimensions of the same reality. Two schools of thought have been of major influence here, and provide an important basis for an interdisciplinary approach to irrigation: the SCOT school (the social construction of technology, see Winner, 1985; Bijker and Law, 1992) and actor-network theory (Latour, 1987; Law, 1994). The basic underlying insight of both approaches is that water management technologies not only mediate people's relationships with bio-physical processes, but also shape the people-people

relationships that are part of water management. Where most existing approaches to water management take either the social relations or the technologies as a given, this insight demands attention to the *interactions* between technology and social relations (Bolding et al., 2000, also see van den Belt, n.d.). An important implication is that what an irrigation system *is*, in an ontological sense, is a question that cannot be answered out of the context in which the system is used.

For irrigation, this insight has been further captured and operationalized by Peter Mollinga, through his characterization of irrigation systems as sociotechnical systems (Mollinga, 1998). Building on the insights of the SCOT school, he distinguishes three main ways in which irrigation is social. First, the development and design of irrigation systems is a process of *social construction*, a recognition that allows analyzing how objectives and interests of different participants in technology development influence design characteristics. Second, irrigation systems have *social requirements for use* in that designs imply and require certain skills and forms of organization in order to work as intended. And third, irrigation systems have particular *social effects* that emerge as a result of the interplay between the intrinsic characteristics of the technology and the (social, physical, political) environment in which it functions (See Mollinga, 1998; Bolding et al., 2000). Some insights from actor-network theory usefully complement this operationalization, in particular its realization that the fate of facts and of artifacts ultimately is in the hands of the final users. For irrigation, this is a particularly useful insight, because many things 'happen' to an irrigation system once its design leaves the drawing boards of the Engineers. All kinds of alterations and modifications are made, first of all during construction, but also later once the system is used. In actor-network terms, an irrigation system undergoes in its life-course many 'translations', a tendency that Engineers may try to counteract by giving their products the character of black boxes (and by presenting their knowledge as generic and universal). Final *closure* is achieved when the possible meanings and uses of a system are no longer contested and when its origins are ascribed to the laws of nature (cf. Bolding, 2004:114).

A further contribution of actor-network theory to thinking about (irrigation) technology and knowledge that is of particular relevance to my project lies in its rejection of *a priori distinctions*, such as those between macro and micro, local and global, science and technology, nature and culture, nature and society, humans and non-humans. According to Latour, such distinctions are never pre-given, but can only be the outcome of the hard construction work of the actors involved (cf. van den Belt, n.d.). In the introduction, I already referred to the fact that much thinking about irrigation, is informed by powerful dichotomies such as nature-culture, private-public, work-home, production-reproduction, technology-society etc. The fact that irrigation tends to be placed on the culture, public, work, production, technology side of the equation and women on the other forms an important impediment to understanding gender in irrigation realities: women tend to be symbolically and metaphorically associated with everything that is NOT irrigation. Notions such as 'sociotechnical systems' (Mollinga, 1998), 'waterscapes'

(Swyngedouw, 1997) and 'naturecultures' or 'cyborgs' (Haraway, 1991, 2003) provide possible ways to overcome this impediment through their capturing of the insight that the boundaries between the two poles of the dichotomies (such as that between 'nature' and 'society', or between 'technology' and 'society') are themselves socially constructed. Definitions of nature (and of technology or society) change and are negotiated and manipulated as part of a political economy of contested access to and control over resources (Haraway 1991, Swyngedouw 1997, Peluso and Watts 2000). Infrastructural and institutional water developments have shaped 'part natural part social', as material dynamic reflections of historic and never ending socio-political-geographical struggles (Swyngedouw, 1997:4,6).

Such insights invite a critical assessment of all truth and knowledge claims about irrigation and, importantly, challenge the monopoly and authority of Engineers to speak *the* truth about irrigation systems: all knowledge is 'local', even though the networks created for irrigation knowledge of Engineers have acquired much wider extension than those created by the irrigation knowledge of users. For Latour and his associates, Engineers (or scientists) are not a fundamentally different type of actors in water networks than irrigators; they have simply grown larger and gained more authority and power. Such a critical attitude towards knowledge and the possibility of knowing tallies well with feminist critiques of science, and with my epistemological position as explained above. It opens the door to new and different conceptualizations and definitions of irrigation systems that are potentially more hospitable to the possibility of female protagonism, it allows questioning taken-for-granted conceptual and metaphorical boundaries many of which have strong gender connotations, and it creates spaces for new forms and possibilities of knowing and of new types of knowers.

Method and outline of the thesis

I started thinking about the linkages between gender and irrigation in 1984, in the first year of my study at the Wageningen University and at the age of 20. At the time of finalizing this thesis, 2006 has just begun and I am 42 - and I still continue to be intrigued by the questions and dilemmas that thinking about these linkages entail. I am quite sure that my fascination will not end with this book: through my work as a gender analysis teacher and researcher, through interactions with colleagues, by learning from and interacting with students interested in and researching the topic, and through my involvement in various networks of water and gender professionals, I continuously am confronted with new questions and puzzles, and with new ways of understanding and looking at gender-and-water realities.

All this is to say that this book, the thesis, is very much a reflection and product of a project that is much less clearly bounded than the book-form allows and suggests. Parts and chapters of the book were originally written in different points of time, in different contexts and partly for different audiences, and many still bear the

traces of their origins. The case studies presented in chapter 3 and 4, for instance, were originally produced for an audience of irrigation professionals that needed to be convinced of the importance of gender. At the time of first analyzing and writing the research findings (mid 1990s), I still more strongly adhered to the belief in the possibility of one 'right' or 'true' representation of irrigation realities. My implicit position of that time probably was that attention to and awareness of gender would lead to better, less biased, accounts of such realities. This position importantly reflects the professional culture and context of which I tried being a part at that time, and with which I identified – at least to some extent. For the purpose of this book, I have re-written the studies to make the ways in which they differ from 'mainstream' accounts of irrigation realities clearer, thereby generating the kinds of questions about ways of seeing and thinking this thesis is about. All the other chapters largely are the product of reflections and analyses that I did from within a university environment, and display a somewhat more critical distance from the 'mainstream' from the start. What links all the chapters is that all, in different ways, try providing an answer to the central research question: *"How can one conceptualize irrigation realities in ways that enable recognition of gender as constitutive?"* The pre-occupation of all chapters is, therefore, with how different conceptual schemes and theoretical languages – which are seen as specific ways of looking at and ordering irrigation worlds, reflecting specific concerns, priorities and interests – visualize women or gender concerns.

The main method I have used throughout the book is that of contrasting and comparing different ways of looking at irrigation realities in view of identifying and understanding the ways in which they portray women and gender relations, and in view of discussing the possibilities such portrayals offer to feminist inquiries in the sense explained above. This method follows from what I explained about my epistemological position. Theoretically, it is inspired by feminist and postcolonial thinkers, who have argued that non-western subjects, and female non-western subjects in particular, tend to figure in dominant western representations as 'the other', as that what exists outside of the normal. Conventional representations of irrigation realities are typically framed in the terms and interests of irrigation professionals. In such representations, the lives and experiences of irrigators are documented in function of larger projects of water control and cropping productivities. In irrigation texts, the represented irrigators are the 'them' who are represented for the sake of 'us', the Engineers and irrigation professionals, so that 'we' can do our jobs better. Irrigators thus discursively exist only insofar as they are functional to the plans and projects of Engineers. As several feminist and postcolonial thinkers have shown, such narcissistic ways of constructing knowledge are also characteristic of more critical and feminist representations of reality that similarly construct 'the other' – non-represented, marginalized or invisible groups – in function of their own critical projects of emancipation and liberation (cf. Spivak, 1988; Mohanty, 1991). The lesson, then, is that attempts at representation should remain critical about any rhetorical or discursive move which places itself beyond

question (cf. Butler, 1995). This lesson can be also be read as a reiteration of one of the important insights of Foucault that discourse is not simply a body of words and sentences, but part of the very structure in which the social world is constructed and controlled as an object of knowledge. Foucault argued that it is in discourse that power and knowledge are joined together (Foucault, 1990:100), rendering the study of discourse inseparable from the study of institutional power, discipline and domination.

This theoretical position carries with it a concern about the ways in which different knowledges are constructed and promoted, and invites questions about the privileged status of some truths and ways of knowing over others. I am not after the one and only correct connection between gender and irrigation, but try accepting that there can be many, heterogeneous and potentially contradictory ones. My quest for those multiple and partial connections can be rendered methodologically in terms of Donna Haraway's 'figurations' (Haraway, 1991). The term refers to ways of expressing feminist forms of knowledge that are not caught in a mimetic relationship to dominant scientific discourse. In moving through and comparing different representations of women and female experience in irrigation, I hope to find spaces and 'in-between' zones that will allow "creating new connections where things were previously disconnected or seemed un-related, where there seemed to be 'nothing to see' "(Braidotti, 1997:76). What has further guided me in my quest for new and better representations of women/gender in irrigation is the already explained belief that the question what women/gender *are*, in an ontological sense, cannot be answered out of the historical context in which they are. In parallel, my adoption of a definition of an irrigation system as a sociotechnical system implies acceptance of the fact that irrigation realities are (also) social, an acceptance that involves the understanding that what an irrigation systems *is* depends on the meanings attributed to it by its users, through their ideas and practices. Thus framing and defining gender and irrigation helps overcoming the use of binary dualisms that I referred to in the introduction, dualisms that through their strong gender connotations often reify those gendered norms, identities and practices that need questioning.¹⁷

In chapter 2, I return as it were to my own first encounters with gender and irrigation realities by revisiting some of the early studies on the gendered impacts of

17 Thinking in binaries supports, and is reflected in, the ways in which much conventional knowledge envisions the relationship between subject – say, the thinker and producer of truth statements – and the object – that about which truth statements are produced -. Rather than simply positing the subject as the one who observes and records information about the object, the realization that the research object is (also) social implies that it 'talks back' (to the subject), and develops concepts and meanings, sometimes in interaction with the subject. Indeed, there are connections between subjects and objects, and the two can be said to stand in a 'dialogic' relationship to each other. The 'object', in other words, includes subjects; every irrigation reality is a socially produced reality and therefore only one among many possible human constructions (cf. Sayer, 1992:22-42).

irrigation projects that were produced in the 1970s and 1980s. These studies showed that irrigation development entailed fundamental changes in tenure and labor relations. Those changes typically favored men, and resulted in women's loss of control over resources and over the products of their own labor. Even where women economically gained from the new income earning opportunities offered by irrigation, such as in the case of Cameroon (Jones, 1986), this gain was achieved at the cost of women's economic autonomy and independence. The studies also showed how this widening of the gender gap in terms of control over resources and incomes depressed yields of irrigated crops. Women lost interest in investing labor and money in irrigation when they were not sure of benefiting from their investments and without the 'free' family labor of women, irrigated crop production became much less lucrative. Women's loss of independent access to and control of land and water also jeopardized household food security by reducing women's capacities to earn incomes or otherwise provide food for their families.

In the chapter, I use such studies to investigate how 'gender and development' and feminist development scholars (and sometimes practitioners) have conceived of the linkages between gender and irrigation, how they have sought to make women and gender visible in irrigation development discourses, and how they have tried to justify and argue more and better attention to women and gender on irrigation development agendas. This exercise serves the purpose of showing the historical and intellectual roots both of my own intellectual quest, as of others' attempts to make sense of gendered irrigation realities. I use the analysis to further draw the contours of my own intellectual project, which importantly consists of an attempt to combine the belief in, and effective thinking about, a feminist irrigation future with a critique of the technological optimism, scientific positivism and theoretical humanism that are characteristic of mainstream engineering.

In chapter 3, I explore how conventional irrigation discourses organize and structure reality and what this means for seeing women and gender. In a way, what I do in this chapter is to make explicit my own frustrations about the limited possibilities of 'seeing women' and 'addressing gender' when looking through 'normal' irrigation eyes. The frequent debates, discussions and arguments I had with my colleagues at IIMI, and with irrigation professionals in international meetings and conferences, have importantly fuelled the contents of this chapter in helping to bring out and clarify the incompatibilities and inconsistencies between Feminists' and Engineers' ways of seeing the world. In the chapter, I identify and discuss a number of features and characteristics of conventional irrigation thinking that explain its resilience to feminist critiques, and that also explain why it is so difficult to see and analyze women and gender. I argue that these characteristics can be grouped in three broad categories. The first is related to the epistemological positivism of much mainstream irrigation thought, and of its overall lack of a critical interpretative tradition. The second group of characteristics has to do with the way in which irrigation systems are ontologically defined, and their boundaries drawn,

and a third group of characteristics relates to the overall absence of power and politics from the analysis.

Chapters 4 and 5 confront more specific mainstream representations of irrigation realities – one about the performance of small irrigation schemes in Burkina Faso, the other about Farmer-Managed Irrigation Systems in Nepal – with my own representation of these same realities, and uses this confrontation to generate lessons about the implications of particular ways of seeing for understanding gender, or for creating discursive spaces for women and gender justice. In chapter 4, I do this by contrasting the findings of the study with, on the one hand, practical and intervention-oriented ‘irrigation in Africa’ discussions, and on the other hand with feminist debates on how to best represent and understand African women. These contrasts generate a number of challenging questions for thinking and conceptualizing irrigated farming in West Africa. In chapter 5, I present and discuss the findings of a gender analysis study conducted in the Chattis Mauja irrigation system in Nepal. This farmer-managed irrigation system has been the focus of many earlier investigations, many of which were done out of a fascination for its complex and well-performing management system. Again, the comparison of the findings of the gender study with those of these earlier studies generates some interesting queries about feminist possibilities to seeing and theorizing irrigation realities.

Chapter 6 in many ways resembles the exercise of chapters 4 and 5, in that it contrasts Andean irrigation realities as constructed on the basis of a review of gender and irrigation studies with other constructions of these realities. The difference with the previous chapters is that this chapter identifies not just two (an Engineering one and a Feminist one), but three different discursive ‘truths’ that each differently describe and analyze the linkages between water control and gender. The co-existence of several conflicting representations, and of several very differently positioned knowers and sources of knowledge, raises questions that are of relevance to the thesis as a whole. These are questions about ‘truth’ and ‘solidarity’ and about the linkages between the two. These are also the larger questions of epistemology (what is true, which claims to truth are acceptable), of discursive authority and political representation (who has the legitimate authority to speak, and on behalf of whom), and indeed of solidarity (whom to identify with and whom to impress or convince). Do legitimacy and authority come with the most accurate representation, with ‘seeing better’ as is often suggested in many writings? Or do, instead, truths come into being because the powers-that-be recognize and endorse them? These questions form the background to this chapter, in which I critically explore how the various irrigation discourses that exist in the Andes represent gender and irrigation realities. The questions also form a prelude to the discussions in the last and concluding chapter of this thesis, about the linkages between ‘visibility’, power and knowledge that are pertinent to the entire project of the thesis.

In all, the thesis importantly hinges on the acknowledgment that irrigation realities cannot be fully grasped and constituted by just one discourse. Although the professional irrigation discourse is dominant, there are also other ways of making

sense of irrigation realities that partly contradict and partly complement 'normal' ways of seeing and thinking in irrigation. Those 'normal' versions of irrigation realities are themselves often characterized by intrinsic tensions and inconsistencies that offer opportunities for change. What has led my search here is the hope that important possibilities for feminist thinking precisely lie in those tensions and inconsistencies, in the disjunctions between complex realities and idealized discursive ones, and in the discontinuities between different discursive versions of realities.

Missionaries and mandarins.¹ Feminists making sense of irrigation.

"...it is our contention that the unsatisfactory recognition of women's rights and needs within the Scheme remains one of the greatest weaknesses of the 'Mwea system'. It is our doubt about this central aspect, so important for the long term welfare of Mwea families, that has led us to question (...) whether the Mwea pattern ought to be replicated elsewhere." (Hanger and Moris, 1973:244).

"...the chronic undernutrition in the Mahaweli H area is a direct result of planning that cuts women off from their productive resources. It is of primary importance that women, who have to provide the daily food for their children and other members of the family, have the means to obtain sufficient food. (...) Research showed that only 35% of the net income of the male farmer (after debts were paid off) benefitted the rest of the household." (Schrijvers, 1984: 270)

Irrigation projects, and settlement schemes in particular, have provided some of the most striking and appalling examples of how a neglect of prevailing gender relations in planning and implementing irrigation projects negatively affected project outcomes as well as impacts on women. Studies carried out in the 1970s and 1980s², though the different authors write with varying degrees of care and detail, all provide a strikingly similar picture with respect to the changes and disruptions in gender relations provoked by the introduction of irrigation projects. The examples have provided irrigation systems with a particularly poor reputation among feminists. Three of the more telling and illustrative irrigation examples that have become almost paradigmatic in my own thinking are summarized in box 1 to 3.³

1 This is the title of a book by Miller and Razavi, on feminist engagement with development institutions. See Miller and Razavi, 1998.

2 Examples of such studies, in addition to the ones described in more detail further in the text, are Bernal, 1981 for Sudan, Chimedza, 1989 for Zimbabwe, Conti, 1979 for Burkina Faso and Jackson, 1985 for Nigeria.

3 These summaries are presented in a simplified fashion focusing on the topic of this thesis.

The studies showed that irrigation development entailed fundamental changes in tenure and labor relations. Those changes typically favored men, and resulted in women's loss of control over resources and over the products of their own labor. Even where women economically gained from the new income earning opportunities offered by irrigation, such as in the case of Cameroon (Jones, 1986), this gain was achieved at the cost of women's economic autonomy and independence. The studies also showed how this widening of the gender gap in terms of control over resources and incomes depressed yields of irrigated crops. Women lost interest in investing labor and money in irrigation when they were not sure of benefiting from their investments and without the 'free' family labor of women, irrigated crop production became much less lucrative. Women's loss of independent access to and control of land and water also jeopardized household food security by reducing women's capacities to earn incomes or otherwise provide food for their families.⁴

Such evidence suggests that irrigation designs, institutions and development processes have the capacity to modify labor and land-and water tenure relations, and that gender is one important axis around which these changes occur. Why is this so? What is it about irrigation that its development so often goes accompanied with a decrease in gender equality? Is it largely due to the male chauvinism of project planners and engineers? Is it a result of western patriarchal ideas that somehow have become embodied in irrigation designs and irrigation planning procedures? Is there something inherently women-unfriendly in irrigation? Or is irrigation one rather arbitrary element in a worldwide alliance between capitalism and patriarchy to exploit women's labor and control women's bodies? These are the kind of questions that prompted my own thinking about gender and irrigation, and these are also the questions that provided the starting point of this thesis.

I use this chapter to present and discuss possible answers to these questions as a way of showing the historical and intellectual roots both of my own intellectual quest, as of others' attempts to make sense of gendered irrigation realities. I do this on the basis of a review of the early gender and irrigation studies which I discuss by placing them in the context of wider gender and development or feminist development debates. The review allows the distinction of four different narratives which have provided the larger frame or story-line of gender and irrigation studies. These four can be roughly divided in two categories embodying different analyses of social reality, and reflecting different views of social change, and can more or less be associated with more 'reformist' or more 'transformative' or radical positions on the feminist political spectrum. The more reformist narratives remain faithful to the existing epistemological and political premises of mainstream irrigation thinking. While the studies adopting this position serve the important objective of making women visible to an irrigation audience, they have many shortcomings in terms of

4 Also see Zwarteveen (1994a), which provides one of my earlier attempts to review and make sense of the evidence of the early 'gender and irrigation' studies.

their analysis of the dynamics of gender relations and gender equity. In contrast, many of the texts that can be associated with more transformative positions and that are more firmly inscribed in and committed to radical feminist agendas tend to reject irrigation as a feminist road to development on the basis of its (intrinsic) patriarchal, capitalist or masculine characteristics.

I start the chapter with explaining how irrigation plans and projects that were conceived before the 1980s saw the linkages between irrigation and gender. Although they seldom mentioned women or gender, these plans anticipated that both men and women would benefit from new irrigation possibilities. A first possible answer to why this did not happen, discussed in the section after this introduction, was provided by the so-called Women in Development school of thought, which basically reasoned that planners and engineers' prejudices and biases caused the marginalization of women. A second answer, consequently discussed, looks at the *process* of irrigation development projects, and basically argues that the exclusion of women from this process explains why they have not benefited (as much as men) from irrigation. These first two narratives about the linkages between gender and irrigation provide answers of use to practitioners who are concerned with the immediate problem of planning and designing more 'gender-friendly' irrigation projects, and with finding workable solutions to the marginalization and exclusion of women. A second set of answers is couched in narratives that are more critical of the possibilities for solutions within existing social and political structures and irrigation knowledge frameworks. The Marxist narrative argues that irrigation is an important element in triggering processes of commoditization that tend to go accompanied with processes of 'housewife-ization' (cf. Bennholdt-Thomsen, 1991), whereas the eco-feminist narrative contends that irrigation is an exponent of an intrinsically masculinist way of thinking and behaving, which explains why irrigation systems tend to work against women (and against nature).

I use the discussion of these narratives to locate myself intellectually and ideologically in the debates that inform them, and to further draw the contours of my own intellectual project. The chapter concludes with a discussion of the gap between the two sets of narratives, and argues that attempts at bridging it form the core of the feminist project in irrigation. These attempts consist in exploring how the belief in, and effective thinking about, a feminist irrigation future can be fruitfully linked to a critique of the technological optimism, scientific positivism and theoretical humanism that are characteristic of the reformist position.

Box 1: *The Mwea irrigation scheme in Kenya*

One of the earliest descriptions of how irrigation development disrupts gender relations and affects women is that of the Mwea irrigation scheme in Kenya.⁵ Inside the scheme, women had access to only a very small piece of land to grow food crops. Outside of the Mwea settlement scheme, women used to have non-irrigated plots on which they cultivated food crops. The land was usually obtained from a husband at marriage and was very rarely taken away. With very few exceptions, women held complete control over this garden and its products. Its primary purpose was to produce food for the family, but any surplus could be traded or sold by her to obtain a small additional income.

The most significant difference in the lives of settler families as compared to the traditional pattern arose not because of the extra work entailed in rice growing -- through this did put an extra burden on the wife at the peak season -- but rather because women could no longer depend on their own resources to provide the family's food and to earn an individual income. Within the Mwea scheme, some provisions had been made for home gardens, but as these were not part of the scheme's official system (and so not an embarrassment to a management that permits their use but denies their necessity), official allocations had not been made. Although women were contributing extra labor to the rice cultivation controlled by their husbands, they could make little official claim on the gross income received by them.

For women it was important to earn an individual income, because "Mwea women continued to feel that it was their responsibility as wives to provide food for their families" (Hangar and Moris, 1973:230). Also, and unlike anticipated by the scheme's planners, tenant families had not made the transition from maize (and beans) to rice as their staple food. The options of women to comply with their food provision responsibility were extremely limited within the scheme, as there was no land available for growing maize and beans. Women could also not rely on their husbands for food or cash, because contributions from husbands tended to be insecure. Husbands often spent a substantial amount of the income from rice on beer or other individual purchases and women had little means to prevent this from happening: "(...) a woman has little official claim on the gross income that will be paid to her husband for his delivered paddy (...)" (Hangar and Moris, 1973:241).

What women could do was to sell small amounts of 'subsistence rice' -- a small portion of the harvest that the management allowed tenants to keep for subsistence purposes -- on the black market. It was more difficult for husbands to refuse their wives access to this subsistence rice as it was to deny their access to the income received from the sale of rice. Even though the amounts of rice thus traded by women were small (as the scheme's management was doing everything it could to reduce black market trade), the access to this income was extremely important to women. A second way for women to adapt themselves to the new situation was to engage in off-scheme enterprises or to earn an income by working as wage laborers for other villagers which were on a different harvesting schedule. A third and more radical way women reacted to Mwea life was to leave their husbands; even though the rate of marital instability was not studied, it was observed that many tenants were deserted by their wives. In spite of these strategies, most women felt (ten years after settlement) that Mwea was an unattractive place to live.

5 What follows is a summarized account of Hangar and Moris, 1973. Also see Wambui Njagi, 2004 whose analysis shows that the patterns as described by Hangar and Moris could still be discerned in 2004.

Box 2: *The Mahaweli scheme in Sri Lanka*

Another well-documented and studied example of the changes provoked in gender relations by a settlement scheme is that of the Mahaweli in Sri Lanka.⁶ As in Mwea, the new situation in the Mahaweli scheme differed from the situation outside the scheme primarily in respect to the sharp reduction in availability of rainfed lands for the production of food crops. Whilst rice, the traditional 'male' crop was the food most appreciated, the population had survived throughout the centuries on millet, the 'female' crop (Schrijvers, 1984; Lund, 1978).⁷ The poorest settlers in the Mahaweli area could not grow enough rice for family subsistence, and the traditional 'emergency food stock' of millet could no longer be depended upon. In the Mahaweli area, some land had been reserved for homesteads, but this half acre (0.2 ha) compound around the house was "hardly big enough for a latrine and some fruit trees" (Schrijvers, 1984:263). Schrijvers argues that: "the chronic undernutrition in the Mahaweli H area is a direct result of planning that cuts women off from their productive resources. It is of primary importance that women, who have to provide the daily food for their children and other members of the family, have the means to obtain sufficient food. (...) Research showed that only 35% of the net income of the male farmer (after debts were paid off) benefitted the rest of the household" (Schrijvers, 1984: 270).

The resulting insecurity and increase in dependency of women on their husbands was reinforced by the change in the land distribution and inheritance rules introduced by the Mahaweli Development Board. Under the traditional Sinhala laws of land ownership, married women too possessed the inalienable right to own land. Under the new scheme of land distribution, land can be distributed to both men and women. However, if the woman is married only the husband is entitled to receive land, and the plot is registered in his name. Thus, if the woman wants to divorce her husband, she is deprived of means of subsistence as she has no right to the family land (Lund, 1978).

In the Mahaweli, the increased dependency on husbands and the decline in the possibilities for women to grow food crops placed women in a very stressful situation. Many settler women in the Mahaweli, when asked their opinion about their new living conditions, also mentioned the fact that their workloads had considerably increased. This was partly due to the absence of nearby female relatives with whom domestic and childcare responsibilities could be shared, and partly because of additional agricultural tasks to be performed in paddy cultivation. Many women were even seen to engage in tasks that traditionally were carried out by men only, "such as clearing the jungle, constructing the bunds of paddy fields; a few women have ventured so far as to take to ploughing which was hitherto an exclusively male performance" (Lund, 1978:35). A last noteworthy change is that inside the Mahaweli, and unlike the traditional situation, most households were organized in nuclear families. This created an intensification and increase in importance of the personal relationships between husbands and wives, and also reinforced the dependency of women on their husbands (reducing their dependency on other family members). As Lund writes:

6 Studies that document and analyze these changes include: Kumar, 1987; Lund, 1978) Rajapakse, 1989 and 1992 and Schrijvers, 1984 and 1992.

7 Unlike in some African situations, in Sri Lanka there is no very strict gender division of crops. Millet is called a 'female' crop here because of the relatively large labor contributions of women to the cultivation of this crop as compared to male labor contributions. For the same reason, rice is called a 'male' crop.

"Whenever there is a conflict between husband and wife, the wife is well nigh helpless not only because she lacks economic power but also because her relations are absent and her anonymity in the impersonal social environment of the resettlement areas." (Lund, 1978:55).

While many women made use of the religious concept of karma to rationalize their plight and to bear the stress (Lund, 1978), they did not passively undergo the changes but developed several strategies to cope with the new situation. Women tried as often as possible to visit their native villages. Many women tried to grow at least part of their food crops on the homestead. Also, in order to cope with the heavy work load, some women organized 'work-parties' and labor exchanges, forms of unpaid reciprocal labor that were rapidly disappearing outside the scheme (Schrijvers, 1992). Other more recent studies suggest that many women engaged in casual wage labor as a way to earn some minimal income of their own, thereby gaining some autonomy from their husbands. It has been documented that some women were effective in bargaining with their husbands for access to a small part of the irrigated land, in return for the labor they contributed to the male controlled crops. And, as in the case of Mwea, some women opted for the radical solution of leaving their husbands (Rajapakse, 1989).

Box 3: *The Jahaly Pachar in the Gambia*

Probably one of the most well-documented cases of gender biased irrigation development planning is that of the Jahaly Pachar project in the Gambia.⁸ The following summary is directly taken from Carney (1998):

Each project adhered to a similar technological package: the introduction of high-yielding dwarf rice varieties, the construction of irrigation canals, and reliance on pumps for water delivery during the dry season or during water-deficient periods during the wet season. The principal differences in the two phases of irrigation were in the form of perimeter control and land allocation. The small-scale projects remained under customary tenure within the jurisdiction of a single community while the Jahaly-Pacharr scheme operated on a thirty year lease, which legally permitted the management to evict unproductive farmers. The large-scale scheme provided a centralized water delivery system in each of the two swamps, involving nearly 2000 households in 65 villages. The canal infrastructure in the small-scale perimeters served 0.4 hectare; it was divided into four to ten plots, which were all allocated to different village families. The water delivery system in Jahaly-Pacharr reached ten hectare blocks, with plot size and land allocation averaging 0.5 hectare.

These differences in water delivery system and land control between the two types of irrigation systems serve as the backdrop for the gender issues that erupted in the projects. Each project credited farmers the seeds, fertilizers, pesticides, and fuel costs for water delivery. Credit repayment depended upon meeting anticipated productivity rates. Double-cropping, however, required a mobilization of male as well as female family labor for year round farming. In order to overcome male aversion to farming rice - a problem that had plagued colonial swamp development projects - development strategies adhered to a remarkably similar course by introducing the technical package for irrigated rice to male

⁸ Publications documenting this from different perspectives include: Braun et al. 1989; Carney 1986, 1988a and b, 1992, 1993, 1994, 1996 and 1998; Carney and Watts, 1991; Dey 1982 and 1990; Kooijman, 1990; Webb, 1989.

household members (Dey, 1981, Carney, 1993). Yet, the sequence of cropping activities depended upon the availability of male and female family labor. By placing men in charge of technologically-improved rice production, the donors hoped to encourage male participation; instead, they unwittingly legitimized male control over the surpluses gained from double cropping.

Control over the disposition of marketable surpluses proved pivotal to the gender-based conflicts that erupted within project households over which family members were to assume the increased work load. Many household heads claimed female labor under the customary category, *maruo*, but irrigated farming spelled a fundamental shift in the labor obligations regulating the traditional cropping system. *Maruo* labor claims had developed in the context of a five-months agricultural season; double-cropped irrigated rice required invoking the *maruo* obligation for year-round labor. There was thus no precedent for women to perform *maruo* subsistence labor during two cropping periods when production would yield men a marketable surplus.

The donor's uninformed view of the Gambian household-based production system resulted in gender conflict that frustrated double-cropping objectives. In the two phases of Gambian irrigation development female rice farmers responded in three principal ways to the loss of their rice fields and efforts to augment their rice burden through the *maruo* designation on irrigated land: 1) by providing *maruo* labor for one cropping season and relocating *kamanyango* production to unimproved swamp land where they could generate small surpluses for sale; 2) when alternative swampland for rice farming was not available, by agreeing to perform *maruo* obligations on irrigated rice plots during the dry season cycle in exchange for using the same plot as *kamanyango* during the rainy season; or by 3) by laboring year-round on irrigated schemes but demanding remuneration in rice for their labor during one cropping season (Carney, 1993). All but the first response involved an increase in woman's labor. Conflict resolution, however, was to profoundly affect double-cropping objectives. (Carney, 1998: 329-331)

Irrigation, modernization and development

Although most irrigation development efforts before the 1980s did not explicitly mention women, they often did have implicit ideas about the linkages between development and gender relations. Although rarely explicitly spelled out,⁹ in this period professional irrigation thinking and policies were couched in a liberal world view, and informed by liberal neo-classical economics and modernization thinking with its associated strong positivist beliefs in technology as a motor of progress (See Eggink and Ubels, 1984). Modernization theory perceives development as an evolutionary, linear process of change which takes societies from their pre-modern, primitive, phase through a series of stages towards the final destination of modernity. Each stage is different and superior to the previous one, so development

9 It can be safely assumed that the lack of explicit reference to development theories in irrigation policy discourses and plans happened largely because the world view they reflected was dominant and not contested.

is depicted as a cumulative process of improvement of living standards. According to modernization theory, progress comes about through the 'liberation of Man from Nature' by means of an increase in the scale of production and productivity. Problems of development are seen and defined as technical and economical problems.

The project of irrigation planners in the latter half of the 20th century undeniably was a modernization project. The idea was that through the introduction of modern irrigation technology, poor and backward peasants could be modernized and evolve into modern individuals in the form of model farmers (cf. Eggink and Ubels, 1984:129; Mollinga and Vincent, 1996). Although discussed in neutral, free-floating and a-historical terms, the modern farmer was a very specific kind of rational individual: innovative and progressive, competitive and risk-taking or entrepreneurial. This individual was thought to be of the masculine gender. Schrijvers, in her discussion of the Mahaweli H, for instance cites a feasibility study drafted by a French firm on the settlement policy: "the ideal pioneer (called the 'paradigmatic settler') comes clearly to the fore as a young man gifted with entrepreneurial qualities" (Schrijvers, 1988:44). The report gives the following description of the ideal settler: "...one who is not inhibited by a long practice of submissive behavior towards officials and who is capable of dealing with them on equal terms ...one with initiative, enthusiasm and a pioneer spirit...one who is an experienced farmer...able to participate in the management of his community... He should live in the project area with his family" (Sogreah report, 1972:157, cited in Schrijvers, 1988:44).

Although this modern individualist, the irrigated farmer, was a male, the modernization project offered an optimistic prognosis for women as well.¹⁰ It was believed that women would benefit from the erosion of primordial relationships and superstitious beliefs. Modernization and development were thought to lead to a replacement of the traditional extended family, the site of virtual all social activities, by the modern nuclear family, separated off from the public sphere of production. Within the family, there would be an increasing division of labor, with women and men specializing in different aspects of household activities. In economists' terms, this division of labor would reflect the principle of comparative advantage (Becker, 1981). Given women's central role in procreation, it would be rational for them to specialize in domestic labor, which was compatible with this role, while men specialized in full-time production for the market. Sociologists interpreted this division of labor in terms of a socially functional role-differentiation. Women and men were socialized into personality types that fitted them for different roles within the family. Men specialized in instrumental roles and acquired the characteristics that went with them: rational, objective, competitive and aggressive. Women were entrusted with the affective, homemaking role within the private sphere of family life. This division into complementary, non-overlapping roles was necessary for the

10 This account of 'the modern woman' is based on Kabeer (Kabeer, 1995:17)

smooth functioning of both family and society: it eliminated competition between husband and wife, ensured the proper socialization of children and allowed the family to act in unison in relation to the rest of the world.

In some irrigation development projects active efforts were undertaken to help and stimulate both men and women to assume these biologically and naturally ordained roles. Men were assisted through training and the provision of inputs and credit, support that was aimed at turning them into productive and modern farmers. Women were likewise offered support that would help them become modern housewives and mothers. In the Sri Lankan Mahaweli example, again, 'Home Development Centers' were established where women settlers were supposed to learn 'in short courses' how to become better farm housewives. The training program contained 'health, nutrition, sanitation, poultry, home-gardening and needle-work' (with special emphasis on macrame) (Schrijvers, 1988:47). Likewise, in Peru, irrigation projects reflected some awareness of women as domestic consumers of water and often included specific programs directed at women as mothers and housewives (Deutch Lynch, 1991).

In what follows in this section, I describe and discuss feminist reactions and critiques to these projects, and to the ideas and development visions they promoted and on which they were based.

Women in Irrigation Development: inclusion and biases

In all, the implicit idea behind many irrigation schemes was that *both* men and women would benefit from new irrigation opportunities. Wives of male farmers and titleholders would more or less automatically share in the increased production, and derived incomes irrigation would yield. Yet, and as the cases summarized at the beginning of this chapter clearly illustrate, this idea did not materialize in many cases. Why was this so? Many early attempts to answer this question pointed at (male, white) development planners as the culprits: they had overlooked and misunderstood women, as a result of which women had been 'left out' from irrigation development. The resulting approach to remedy gender injustices and inequalities in irrigation development sought to make women visible as a category in development research and policy. This approach has come to be known and referred to as the WID (Women in Development) approach. It was based on the conviction that if only planners and policymakers could be made to see women's concrete and valuable contributions to the production of irrigated crops and the management of water, women would no longer be marginalized in the irrigation development process.

The problem as perceived by many WID scholars was how to ensure that the benefits of modernization would reach women, too. Boserup's book 'Women's Role in Economic Development' (Boserup, 1970) became seminal in providing a frame of analysis that helped phrasing this problem. In the book, Boserup drew attention to variations in sex roles across cultures. She suggested that, since women were almost

always primarily responsible for reproductive work, it was differences in their productive roles that explained differences in their status across the world: where women were confined primarily to reproductive work, their status was likely to be low. In what she termed 'female farming systems', prevailing in much of sub-Saharan Africa and parts of Southeast Asia, women enjoyed 'considerable freedom of movement and some economic independence based on their significant role in production'. This was in marked contrast to the restrictions imposed on women in the 'male farming systems' of South and West Asia whose status was based primarily on the fulfillment of their reproductive roles.¹¹

Boserup attributed the failure of modernization to benefit women to a variety of factors reflecting different cultural contexts. In female farming systems, particularly in sub-Saharan Africa, women had been deprived of access to training, land rights, education and technology by colonial and post-colonial administrators whose biased perceptions led them to favor male farmers. In the final analysis, she suggests that the modern economy that was actively promoted by development planners had brought new resources and opportunities to men, but left women on the margins of development. Consequently, "the productivity, attitude and outlook of men and women began to diverge, just as we found happening when commercial farming replaced subsistence agriculture; men become familiar with modern equipment and learn to adapt themselves to modern ways of life, while women continue in the old ways" (Boserup, 1970:139). Boserup identified differential access to technology as a main underlying cause for explaining that men have turned into more productive producers than women: "As agriculture becomes less dependent upon human muscular power, the difference in labor productivity between the sexes might be expected to narrow. In actual fact ... it is usually men who learn to operate the new types of equipment while women continue to work with the old hand tools ... the productivity gap tends to widen because men monopolize the use of new equipment and the modern agricultural methods.... Thus, in the course of agricultural development, men's labour productivity tends to increase while women's remains more or less static. The corollary of the relative decline in women's labor productivity is a decline in their relative status within agriculture, and, as a further result, women will want to either abandon agriculture and retire to domestic life, or to leave for town" (Boserup, 1970:53).

Boserup's condemnation of planners' tendency to see women as 'secondary' earners and of their emphasis on training them to be more efficient housewives rather than seeking to improve their professional ability to compete with men in the marketplace was taken up by many subsequent WID scholars. Tinker (1976), for instance, suggested that "Western stereotypes of appropriate roles and occupations tended to be exported with aid" (Tinker, 1976:33), so that modernization continuously widened the gap between the ability of men and women to cope with

¹¹ Boserup's frame of analysis continues to inform some contemporary gender and development work, also in irrigation. See for instance Van Koppen, 2002.

the modern world. Like Boserup, Tinker held male development planners accountable for creating development processes that did not benefit women. Rogers' (1980) investigation of the association between women and 'the fringe area' of welfare in development planning came to a similar conclusion. Existing policy represented a form of discrimination based on the imposition of "those aspects of external influence and intervention which treat women as different from men, not because of their different 'traditional' activities and responsibilities, but because of a very specific Western (men's) model of what women in general should be, and what they should and should not do." (Rogers, 1980:35). She provided examples of sex segregation in development planning which had led to an emphasis on training women in domestic skills ('a woman's place is in home economics') and later, with the advent of WID advocacy, on 'special considerations' projects, mainly handicrafts and small-scale income generating projects. Using examples from a number of development interventions, including irrigation projects, she pointed out how denying incentives to women had undermined project performance. Her advice was that planners needed to stop offering 'special projects' that perpetuated women's marginal status and seek instead to eliminate gender discrimination in *all* project design, in educational provision and in employment. Ways had to be found to save women's labor, improve their productivity and, most important, to ensure that "incentives for increased production are channeled to the women as well as the men, in proportion to the contributions made by each" (Rogers, 1980:192).

The attribution of the negative gender effects of irrigation interventions to planners' and engineers' conceptual biases and engineering ignorance was also a clear part of the analysis of most early 'gender and irrigation' studies. Hanger and Moris (1974), in their analysis of changes in family life caused by the Mwea scheme, argued that the divergence between the role that was attributed to women in the Scheme's plan and their actual role posed "a continuing problem for the future success of the Scheme as a whole in its attempts to transform tenants' family life" (Hanger and Moris, 1974:210). Schrijvers, in her study of the Mahaweli Scheme in Sri Lanka, partly blamed the planner's concept of the household for obscuring inequalities at grassroots level which led to undernutrition (Schrijvers, 1984:270). Jones, addressing an audience of researchers rather than planners, also argued for a better and more explicit recognition of intra-household dynamics when studying agricultural development. She claimed that "without such information, farming systems researchers cannot make informed judgments about the viability of new technologies and their impact on individual farmer welfare" (Jones, 1986:119). Carney, even though she also provided alternative explanations, likewise concluded her analysis of the Jahally Pacharr project with a plea for a better recognition of "the importance in many parts of the world of women's role in food production and its linkage to specific knowledge systems of environmental resources" (Carney, 1998:333).

A review of the studies that (partly) blame planners' and engineers' biases for the negative gender consequences of irrigation development shows that there were

indeed a number of persistent gendered assumptions that guided irrigation development interventions. Most of these assumptions were derived from the idea of the unitary household, in which the male farmer is seen as the manager of all household and farm resources. He was conceived and addressed as the single focus of decision making and as the person to whom all costs and benefits accrued. While it was acknowledged that there was a woman around (his wife), her position in the farm was generally referred to and approached as that of his assistant. She would help her husband whenever a need arose, her main occupation being that of a mother, cook and housekeeper. Assumptions derived from this unitary household model are¹²:

1. Raising the income of male farmers (through improved irrigation facilities and services) leads to improved well-being for himself as well as for his family. Or: the male farmer is the main (or even the sole) provider and income-earner.
2. Farm household resources and labor are effectively controlled and allocated by the male household head. Or: Male household heads have the power and authority to mobilize all household labor and resources for irrigated farming.
3. The rural household is composed of two able bodied adult members (one male and one female) and a number of children.
4. The labor of wives of male farmers is confined to assisting their husbands on his (or family) fields, in addition to domestic or reproductive tasks.
5. Irrigated agriculture is the main and only income and food generating activity of farm households. All available resources and labor are allocated to irrigated agriculture. The main objective of irrigated farming is to maximize returns to these resources.

Irrigation designs and planning processes were based on these gender biased notions, and often also actively contributed to their dissemination. Several studies show (Vercruyssen, 1991; Lund, 1978; Van Koppen, 2000) for instance, that the determination of the appropriate size of plots in new irrigation schemes was based on gendered criteria: plot sizes were based on an assessment of *family* need (potential yields needed to be enough for sustaining a family) or the availability of *family* labor (enough household labor for farming the plot needed to be available). In the design phase of the Jahally Pacharr scheme in the Gambia, for instance, a choice was made for plot sizes of 0.5 ha on the basis of both technical and social criteria. It was assumed that a household would be able to provide 75 person-days, if they would receive help from their neighbors (van Hooff, 1990). Directly related to the determination of plot size was the frequently formulated rule that only those individuals with access to a minimum amount of family labor would be eligible to obtain rights to newly irrigated plots. This was for instance the rule in the Mahaweli scheme in Sri Lanka (Lund, 1987; Schrijvers, 1984) and also guided the allocation of irrigated plots in small tank irrigation schemes in Burkina Faso (PSF, 1993). Since

¹² See Zwarteveen, 1994a for a more elaborate discussion of these assumptions. Jennie Dey provides a similar list specifically geared towards irrigation development in Africa (Dey, 1990:2).

only men were thought to be able to mobilize family labor, this land allocation rule severely discriminated against women.

Another important way in which the above listed assumptions were disseminated was through the ways in which the processes of design and planning were organized. Barbara van Koppen in her various writings (Van Koppen, 1998a and b; 2000) clearly illustrates and demonstrates how planners' and project implementers' ideas of the unitary household, coupled with the automatic association of irrigated farming with the masculine gender, led to the a priori exclusion of women from all negotiations with future users regarding new projects. The most far-reaching effect this has had is that women, in many cases, could not obtain rights to land and water in new irrigation schemes. In a number of small scale irrigation schemes in Burkina Faso, for instance, participation in construction was the requirement for obtaining rights to newly developed land and water. There already were fewer women than men who came forward to participate in construction works, because women were not informed about the procedures and unaware of the fact that they could obtain rights to irrigated land by contributing labor to construction. If they nevertheless did work in construction, this often did not lead to the registration of plots in their names, too. This was either because their labor contributions were counted in the name of their husbands (again the result of a unitary household notion). Disregard of women's labor contributions also happened because of yet another widespread gender stereotype: the idea that women are physically less able to perform construction work. Based on this idea, women's work was often judged to be of lesser value than men's (Van Koppen, 1998a; see also Zoungrana, 1995 and PSF, 1993) and thus did not merit a reward in the form of rights to newly irrigated plots. In addition to his (supposed) ability to mobilize (family) labor, he was also supposed to have access to and control of all the other material and social resources required for irrigated farming. Important in this respect are credit and agricultural inputs, and access to markets. Just as newly irrigated land was in many cases allocated to men only, support services were in many projects typically only directed at male farmers. Women were, in their turn, provided with support that would allow them to better carry out their domestic and caring activities.

It is probably no exaggeration to state that the initial ideas on which irrigation design and planning choices were based have in many instances become partially self full-filling prophecies. New entitlements to land and water and the provision of support services were all geared towards men so as to turn them into the ideal farmer assumed by policies. The simultaneous denial of such rights and services to women can be construed as a strategy to transform them into the dependent housewives implicit in the same policies.¹³ Dorien Brunt, in her analysis of irrigation

13 This is not to say that these policies, plans and designs were always successful in re-arranging intra-household relations. Indeed, many of the documented failures of irrigation development projects to achieve their objectives can be partly attributed to the difficulty to actually (re-) mold the intra-household organization and the behavior of household members into the planners'

development in Jalisco in México describes this as follows: “The changes in the wider environment institutionalized the mainstream ideology that men were heads of households, and that women were dependent on them. Men were approached by intervening parties in their function of *ejidatarios*, they became experienced in finding their way through the institutional and economic environment. And in this way they became ‘farmers’. Women had hardly any prospects of learning this by experience: they were considered to be housewives. This, in combination with their loss of control over production because of the change from produce from home consumption to produce for the market, and the relocation and manner of laying out the new village, considerably influenced their position within the farm enterprise. Women became marginal to the agricultural production process. While men became farmers, women became housewives.” (Brunt, 1992:119)

The WID approach in irrigation contributed to the recognition of women and men beyond their stereotypical and assumed roles as respectively housewives (or mothers) and farmers. The approach made it possible to see that women also farm, and not just as ‘helpers of their husbands’. It made it clear that what women do, and the way in which irrigated farming is organized at the household level, affects the outcomes of irrigation systems in terms of efficiency and productivity. The approach thus allowed convincingly arguing that irrigation development will be more successful if women are recognized and taken into account. In the irrigation domain, one of the results of the approach was the production of a number of check-lists and guidelines to be used by planners and project staff for anticipating and assessing the gender impacts of envisaged projects.¹⁴

Although useful to get women on mainstream irrigation agendas and to claim resources and staff for gender specific concerns, the WID approach also had a number of problems. The most fundamental drawback was that it perpetuated an image of Irrigation Engineers as small ‘gods’ who had the power (and knowledge) to mold and create the world according to their own, scientifically informed and thus superior, insights and beliefs. Irrigation Engineers were implicitly seen as essentially benign and neutral agents who, with sufficiently accurate information, could be relied upon to implement the universal good. In maintaining and reifying this image of Engineers, the WID project cherished rather than challenged the strong belief in the objectivity and neutrality (and also the power) of engineers and planners’

model. Both male and female farmers often behaved differently than what policymakers and planners had hoped and expected, and in many documented instances, women and men actively resisted the process of ‘housewife-ization’ (cf. Bennholdt-Thomsen, 1991). The only instances where planners were relatively successful in both spatially as well as socially re-arranging production relations was in settlement schemes such as the Mwea scheme in Kenya and the Mahaweli scheme in Sri Lanka. In these schemes an extreme degree of control over the livelihoods of settlers was exercised through all kinds of means. Crop choices were made mandatory, as was the timing of planting operations. Marketing was centralized: the harvested crops were to be delivered to central marketing boards, and payments for inputs (and sometimes plowing services) were deduced from the money given to producers.

14 Among these are FAO, 1982 and 1998; GTZ, 1996; Boschman, 1994.

knowledge and designs. This belief sits uneasily, first of all, with the recognition that irrigation knowledge and technology is not neutral. Gendered assumptions fundamentally impact on design choices and thus on the technical lay-out of the system. Design choices are not just the result of rational, objective and mathematical applications of the laws of nature as expressed in hydraulic and hydrological principles, but are also based on assumptions regarding the desired behavior of future users. And irrigation technologies require certain forms of (organized) behavior in order to function as intended. Irrigation technology and knowledge is thus socially constructed.¹⁵ This insight considerably expands the avenues to explore in search for answers to the *why* questions about the negative gender effects of irrigation development. It leads beyond the questions of prejudice and preconceptions of the WID project, first of all to the direct questioning of the effect of the (gender) identity of the designer on design choices (or of the planner on the planning choices) and to how designs are shaped by their social, political and historical contexts. Beyond these direct questions, understanding irrigation systems as social constructions leads to looking at how the very conceptual schemes, professional cultures and epistemologies that guide irrigation development are reflecting and reflected in existing gendered norms, identities and structures.

The image of planners and engineers as benign and neutral agents is also problematic in view of the much needed 'demythologization' of planned intervention (Long and van der Ploeg, 1989). Planning is not the linear and logical step-by-step process moving from identification to implementation, which is the way it is often presented. Planning and design are complex processes of formal and less formal, legal and illegal, open and hidden interactions and negotiations of different interest groups. They are therefore better understood as political processes in which many interests are at stake, rather than as prescriptive recipes. A view of design and planning as political processes also better allows asking the question what women want, or what kind of development is good for them. It allows, in other words, to recognize women as agents, as knowledgeable and capable actors and as active players in creating their own social and material environments, even when they have to operate within an irrigation context that is only partially of their own making, and with motivations that are only partially conscious (cf. Giddens, 1984; Bourdieu, 1977). The WID project did not invite such recognition; it made it possible to see women and allowed them to become players in the irrigation game, but not to determine the rules of the game. It tended to hide what women's activities in the

15 This insight has led to a number of studies done by MSc students of the Irrigation and Water Engineering Group at Wageningen University in the eighties. The studies were aimed at 'cracking the code' of irrigation technology, so as to unravel the characteristics of the technology that could be held accountable for the negative effects of irrigation development on gender equity. The studies leaned heavily on the Social Construction of Technology (SCOT) School of thinking. Although the lines of investigation thus laid out were consequently abandoned, the insight that irrigation systems are 'sociotechnical systems' (Mollinga, 1998) remained fundamental to the research program of the group, and also to this thesis.

'male defined' irrigation world meant to women themselves. The focus was on showing that woman's activities and behavior mattered for what established irrigation professionalism had defined and accepted as important. Productive labor activities by women thus became visible, but the definition of work was not challenged and subsistence labor and child care continued to be seen as non-work. Likewise, the domains of the family, the home, consumption and reproduction – which are an intrinsic part of daily farming life – continued to remain elusive to thinking about and planning irrigation

A related problem with the WID school was that the analysis of gender inequity remained rather implicit. It was restricted to those factors that directly related to the irrigation context as it was conventionally defined. The arguments that were used to advocate greater attention to gender tended to be rather functional and instrumental. More attention to women was justified on the basis of promises of greater efficiency, productivity or effectiveness, rather than on the basis of social justice or equity. This led to sometimes exaggerated claims about the benefits of investing in women, and directed research efforts to gathering evidence about the productivity of women rather than to understanding the nature and dynamics of gendered power relations in irrigation development. Gender equality was primarily defined in terms of opening up access to irrigated land and water, new irrigation technologies, credit and other related support services to women as well and thus ignored important factors of male dominance which were not directly related to irrigation. In addition, one of the messages conveyed by the produced guidelines and check-lists was that a proper *recognition and accommodation* of existing gender relations in project plans and designs was enough to ensure some degree of gender equity in the future. The pre-irrigation situation in terms of gender relations was thus implicitly taken not only as the yard stick against which to measure changes brought about by the project, but also as the norm. Boserup's and other's postulation of gender equality in a recent past, based on a distinction between male and female farming systems, supported this message.¹⁶ As Jaquette wrote, claiming resources and attention for women on the basis of historical grounds (equality in the past), or on the basis of efficiency criteria (women produce as much or more as men), is not just analytically problematic, but also strategically dangerous. The hard to prove statement that women had once been equal to men in status and productivity (at least in precolonial Africa and in female farming systems) can be easily refuted by an equally hard to prove counterargument that women have always been subjugated – a return to conventional wisdom. Similarly, the claim that women are as or more productive than men can easily be turned around and used against women: if future

¹⁶ This message did not go uncontested. Anthropological studies showed for instance that although historically many African women had an important role in farming, this did not automatically signify that they enjoyed equal status with men, or that they had equal power. Male domination and discrimination against women also occurred in societies with female farming systems (Huntington, 1975).

studies would show that women's productivity is less, it would mean that women 'deserve' fewer resources (Jaquette, 1990:64-65).

(Lack of) participation

Partly in response to the problems with the WID project, and partly reflecting a more general critique of development, alternative hypotheses to understand gender and irrigation linkages emerged that focused more on irrigation design and planning processes. This set of hypotheses is rooted in more general ideas about participatory development that surfaced at a time (1980s and 1990s) when the dominant development paradigm was coming to grips with the failures of trickle-down state-led growth strategies, prompting the emergence of alternatives. Irrigation development, from the fifties onwards, had been a typical example of government led growth. Almost everywhere, central governments were the main initiators of irrigation development. States typically entrusted ministries of public works with the task of constructing new irrigation systems, leading to a spectacular expansion of irrigation infrastructure and irrigated agriculture particularly in developing countries. In many countries, the government long remained firmly established as the main actor in irrigation development and management. State involvement, which was (and continues to be) justified on the basis of the public goods characteristics of irrigation, became increasingly contested. The growing evidence about the disappointing performance of irrigation agencies, together with the visible and increasing deterioration of existing physical infrastructures were widely diagnosed as clear symptoms of the inherent inability of states to effectively and efficiently manage irrigation systems. This, together with calls for empowerment of users and democratization, led to the development of strategies for increasing the participation of users and farmers in irrigation design and planning processes. In terms of gender, this trend nourished the belief that the failure to accommodate prevailing gender relations in irrigation designs and projects is (at least partly) caused by the top-down fashion in which most irrigation systems were planned and designed. Achieving more gender equitable irrigation development was thus seen as contingent upon more participatory irrigation design and planning processes.

There are a number of studies that provide empirical support for this set of hypotheses. Van Koppen (2000) for instance provides an elaborate analysis of the process of planning and designing irrigation systems in Burkina Faso. She shows that in the early schemes, women were deprived of possibilities to claim rights to newly irrigated land. This happened in spite of the known fact that women were the primary rice cultivators in the region, and in spite of the fact that women traditionally held rights to paddy land. This deprivation occurred partly because of planners' biases and misconceptions about intra-household gender relations, which led to the decision to allocate land to (mostly male) household heads. Another part of the explanation for denying women rights to land is found in the process of land distribution. In the actual process of land distribution, no reference was made to

official demographic lists or agreed upon allocation criteria. Project staff, together with some male administrators passed through the valley. Each traditional land chief appeared whenever the group passed through his portion of land. Plots were allocated on the spot to any man who presented himself. Those who had received information about plot distribution were mainly men who were connected to the predominantly male networks consulted by the project staff. Women were not informed about how and when land distribution would take place. Some of them were lucky enough to see the project officials pass through the valley and came on their own initiative to negotiate for land. Most women, however, missed the opportunity to claim land rights (Van Koppen, 2000).

The analysis of Bruins and Heijmans of a project that was aimed at the rehabilitation of an irrigation system in Nepal also identifies the lack of meaningful participation of women in early negotiations as one crucial cause to explain that the new rehabilitated project did not meet the needs of female farmers. In this system, the Bauraha irrigation system, 30% of farms are de facto headed by women because of male migration. Construction of the new irrigation system took about one and a half year, but works were carried out during seven months. While skilled labor was provided by masons, unskilled labor was provided by the villagers according to their landholding size. Both women and men provided unskilled labor, and women constituted the majority (according to the project economists' estimate even 70%) of the total labor force. Men and women did the same work, which included transportation of sand, stones and cement, digging, making of aggregate, and mixing mortar. However, the project staff merely interacted with male farmers to discuss what kinds of improvements were needed. Male farmers were primarily interested in reducing labor requirements for system maintenance, whereas female farmers also hoped that the rehabilitation would result in an increase of water availability. Although increasing water availability would have been technically possible, this concern was not accommodated. Female farmers, as a result, felt rather disappointed and frustrated with the fact that their labor investments had not been rewarded (Bruins and Heijmans, 1993)

The call for better and more participation of *all* users in planning and design processes has led to a few (all donor funded) projects in which women have been much better and more involved in planning and design.¹⁷ The experiences from these projects show that the very fact that women are taken seriously from the beginning in project planning and design does make a significant difference. It creates the possibility for women to receive information and to be included and represented in decision making networks and platforms. The *participation* approach can be seen as a practical and partial response to the two problems with the WID approach as described above. First, the god-like status of the irrigation planner as the all-knowing implementer of the universal good is questioned by giving (future)

17 Documented examples of successful initiatives include: Arroyo and Boelens, 1997; Grift 1991; Hulsebosch and Ombara 1995; Jordans and Zwarteveen, 1997; NBTDP, 1997; PATA 1996; Zigterman, 1996.

users a voice in deciding about the design and management of irrigation. And second, the participation approach can be seen to (at least partly) recognize the fact that the social and gender identity of the planner (knower, designer) may affect the outcomes and transparency of the planning process.

Yet, the available evidence does not reveal much about the effects of more or less participation of women in planning or management in terms of bringing about greater gender equity, or in terms of altering the nature and direction of irrigation development. Often, the very fact that there is female participation in planning is taken to be the most important indicator of success in gender terms. Does an increased number of women in decision making indeed lead to irrigation systems that are better geared towards meeting the interests and needs of women? Does female participation in planning contribute to strengthening women's control over water and over the benefits of irrigated agricultural production? There are reasons for doubting that this is necessarily or automatically the case.¹⁸ It might be that the participation of women remains rather nominal, such as when women are merely appointed as members for the sake of meeting with requirements of funding agencies. Whether women who are thus appointed do in fact have any real influence on what happens within these organizations and committees is something that is rarely studied. Existing studies that document efforts to improve female participation also remain suspiciously silent on *which* women participate, thereby implicitly assuming that there is indeed a distinct and uniform women's perspective on irrigation development and thus overlooking differences among women.

In sum, many texts adopting the inclusion position focus on ways to improve female participation, or document attempts at doing so, but leave the larger questions about the linkages between participation, gender equity and the nature and direction of irrigation development unanswered. How do different women themselves view and deal with their access to and use of water? How do different women assess the costs and benefits of more formalized and secure rights that would go accompanied with membership of users' organizations? How effective is more formal participation of women if gendered relations of power are very unequal to start with, and if norms and practices do not support female participation in decision-making?¹⁹ To what extent are different women able to indeed voice their real concerns and needs, if the expression of such concerns and needs is circumscribed by norms and ideologies that deny their existence? Does the nature and direction of irrigation development change if women participate in planning, design and management? In theory the call for more participation of women in design and management processes, and the associated increased appreciation of the

18 See also Meinzen-Dick and Zwarteveen, 1998 for a more detailed analysis.

19 Mayoux, 1995 for instance suggests that gender inequalities in resources, time availability and power influence the activities, priorities and framework of participatory projects just as much as 'top-down' development and market activities. She concludes that "increasing the numbers of women involved in participatory projects cannot (...) be seen as a soft alternative to specific attention to change gender inequality" (Mayoux, 1995:235).

value of their knowledge, should automatically also lead to questions about the legitimacy of irrigation knowledge. Participation could indeed be one effective way of challenging the hegemonic superiority of engineers' knowledge and their exclusive claims to the ability to design irrigation systems. Yet, and as Shah convincingly argues, "while inclusion of farmers' knowledge and farmers' choices in the process of 'design' is envisaged by the dominant model, the validity of conventional disciplinary – scientific and engineering – knowledge and the context in which this knowledge is generated, is not very frequently questioned" (Shah, 2003:22). Issues of power and identity, of location and time, thus continue to be shielded off from scrutiny through appeals to 'the technical', 'the rational' and 'the scientific'.

Feminist visions on (irrigation) development

The WID project and the *participation* project continued to believe in the possibility of a better irrigation future for women, and both projects shared an ambition to contribute to realizing such a future. Most writings on gender and irrigation can be identified to belong to either or both of these projects, which is logical given the fact that the interest to study gender and irrigation arose primarily as a policy concern focusing on changing the priorities and practices of development assistance agencies. The development aid context in which many of the studies were inscribed has had (and continues) to have a clear effect on their contents. Many were pragmatic studies of actual conditions of women farmers and women water users, dealing with what was happening and what might be done within the current structures of authority and power.²⁰ There exists, nevertheless, also a more critical tradition of feminist thinking on development. Although few writings on gender and irrigation belong to this tradition, some of the more general feminist critiques of development, technology and science do also apply to irrigation and some of the more detailed ethnographic studies that document gendered changes in relation to irrigation development (such as those summarized at the start of this chapter) are clearly inspired by these more radical feminist theories. Analyses rooted in this tradition are less concerned with finding practical strategies for gender equitable irrigation development, and instead provide an intellectual and ideological critique of the modernist vision of development and of enlightenment ways of thinking on which irrigation development is premised. In fact, the more radical of these more critical scholars even reject irrigation altogether as a possible avenue for a feminist future. The following sections describe and discuss these more critical narratives on the linkages between irrigation and gender relations.

²⁰ See Tinker, 1990:44-53, White, 1992:15-25 and Razavi, 1998 for analyses of the influence of the development aid context on produced studies and texts on women in developing countries.

Marxist feminist perspectives on development

An important strand of critique on modernization was that of Marxist inspired thinkers in the eighties (Benería and Sen, 1981; Sen and Grown, 1985). The marginalization of women, they argued, resulted not so much from women's exclusion from productive labor, but from the exploitation of their labor in the global system of capitalist labor relations. The reasoning was that women are forced by their poverty to participate in a "system that generates and intensifies inequalities" and "makes use of existing gender hierarchies to place women in subordinate positions at each different level of interaction between class and gender" (Benería and Sen, 1981:287). Bandarage (1984) expressed this point of view when she wrote, "Marxists agree with liberal WID thinkers that economic modernization, or more specifically capitalist development, generally marginalizes Third World women. The WID school focuses simply on the outward manifestations of sexual inequality engendered by this process. In contrast, Marxists claim to understand sexual inequality, structurally and dialectically, as it relates to social class inequality and to the uneven and unequal development of capitalism world-wide." (Bandarage, 1984:501)

The analyses of feminist scholars inspired by Marxism echoed and elaborated upon early feminist searches for the origins of female exploitation that linked gender inequality (or the exploitation of women) to capitalism. It consisted of a reversal of the liberal feminist idea that women can become liberated through development. The main story line of many Marxist feminists was that sex roles in 'traditional' societies had been highly reciprocal, that women in these societies were quite autonomous and that social structures had been relatively egalitarian. It was European colonialism which brought in private property, commodity production, cash nexus and Western values (patriarchy) thus laying the foundations for both class and gender inequality in such 'simple' societies (Leacock, 1981; Leacock and Etienne, 1980). In this reasoning gender inequalities and injustices are seen as an *effect* of development, instead of development providing a *solution* to these inequities and injustices. The analyses focused on inheritance and kinship systems, and often related gender equality to the existence of matrifocality (men marrying into the families of their wives). The gradual disappearance of matrifocality was thought to be related to increasing levels of complexity in societies (James, 1978, see also Schenk-Sandbergen, 1995 for a Laotian irrigation example).

Engels' 'The origin of the Family, Private Property and the State' was an important source of inspiration for this line of theorizing. According to Engels, the first division of labor was that between man and woman for the propagation of children. Based on the needs of procreation, this division of labor was a 'pure and simple outgrowth of nature'. Men provided the means of subsistence while women were concerned with the production and reproduction of human life. Associated with this division of labor was an egalitarian and complementary division of spheres of responsibility. Both contributions were seen to be vital to the community so that both sexes enjoyed equal status. Changes in the relations of production, associated

with the development of agriculture, led to the production of a surplus and the accumulation of wealth. Men's control over this wealth and their need to pass it on to identifiable heirs led to overthrowing of mother-rights on which earlier communities had been based, and laid the institutional foundations of women's subjugation, private property, monogamous marriage and patrilineal inheritance. In later history, the emergence of a generalized market economy, the distinguishing feature of the capitalist mode of production, led to a cleavage between the production of commodities, which was shifted to the public sphere of the market place, and the production of human life and labour, which continued in the private sphere of the home. Women's entry into the labor market was seen as the obvious road to end the oppression of kinship and family relations and become subject only to exploitative capitalist relations, just as men (Engels, 1976).²¹

The few writings that apply a Marxist inspired feminist approach to irrigation development saw the introduction of irrigation as part of (or triggering) larger processes or modernization, commercialization or commoditization. The changes in gender relations that accompanied irrigation development were not the simple effects of planners' and engineers' biases, nor were they just the result of top-down planning processes. Instead, irrigation development was seen to promote the commoditization of production and thus created a separation between commodity relations and family (or kinship) relations. In particular, the development of irrigation increased the value of land based resources, leading to the (sometimes artificial) creation of land scarcity and the eradication or transformation of customary tenure arrangements. These changes invariably worked towards the detriment of women's traditional land rights. At the same time, irrigation increased the possibilities to produce marketable production surpluses. The strategies to control and accumulate these surpluses hinged on access to and control of labor, which in turn was often (at least partially) contingent upon control of productive resources, especially land. In this analysis, denying women rights to land was thus part of a more or less conscious strategy of the alliance between patriarchy and capitalism to ensure the provision (and control) of free family labor needed for the production of commodities. The strategy was justified by making use of old and new notions, practices and structures that preached the inferiority (and lesser value) of women.

21 Within development studies, feminists using a Marxist perspective have shared with Engels and with each other a common starting point in the identification of capital accumulation as the driving force behind unequal development and social conflict. They have also shared a common view of gender inequalities as systematically produced by, an indeed essential to, a fundamentally unequal international order. However, they have diverged from traditional Marxism and from each other in the place they give to gender inequalities in their explanation of overall social inequalities. Gender inequalities were either seen as a result of an autonomous system of patriarchy, with patriarchy as the primary form of social inequality (Coward, 1983; Delphy, 1984), or gender inequalities were seen as the consequence of the interaction of autonomous systems of patriarchy and capitalism (Mitchell, 1971; Hartmann, 1979). Which 'contradiction' to prioritize was the topic of much debate at that time. Also see Barret, 1980.

There are few irrigation studies that have systematically adopted and explored this line of reasoning, even though irrigation (re-) settlement schemes do provide a near to perfect illustration of the Marxist feminist thesis. In these schemes the degree of central control over the planning of production and over the livelihoods of settlers was almost totalitarian. In addition to the already mentioned titling programs which strongly favored men, in such schemes the commoditization of farming and the production of surpluses were actively promoted. Crop choices were made mandatory as was the timing of planting operations. Marketing was centralized: the harvested crops were to be delivered to central marketing boards, and payments for inputs (and sometimes plowing services) were deduced from the money given to producers. There was thus no escape from the change from subsistence farming to production for the market.²² A spatial re-arrangement of the location of fields relative to houses further enforced a functional segregation between the productive male sphere and the consumptive female sphere. Possibilities to earn incomes other than through irrigated farming were very limited, which thus more or less left women without options to resist their husband's claims to their labor or to secure some fair compensation for it.

Carney, especially in her earlier writings about the Jahally Pacharr project, comes closest to an analysis that places irrigation development in a broader historical perspective and in a broader development strategy that was aimed at import substitution and national food security (Carney, 1986, 1988a). Other writings merely suggest the linkage without going into a more precise exploration of the mechanisms of change. Ng and Mohamed (1990) in their review of development processes in Malaysia, for instance suggest that irrigation is part and parcel of state-led capitalist growth which is highly patriarchal. Their analysis shows how rural women's labor was reconstituted according to the specific class and gender systems of the different historical periods. Their conclusion about capitalist developments in post-colonial Malaysia is "that the division of labor in *padi* and rubber production is being heightened by a patriarchal State and the nature of the capital accumulation process in the periphery. With the expansion of wage-labor in both the agricultural and non-agricultural sectors, and the introduction of mechanization, the basis for a gender division of labor is being established making for gender inequality in the *padi* production process. (...) women, especially those from the poorer peasant and female-headed households, are relegated to a secondary and subordinate position in production. Their reproductive roles are being increasingly emphasized and being used to justify this relegation" (Ng and Mohamed, 1990:79-80). Many other scholars belonging to this more critical Marxist-feminist position mention irrigation in their accounts of how development is premised on the further exploitation of women, and show how the success of irrigation projects crucially depends on the project's ability to mobilize cheap female labor. Agarwal, in her analysis of gender and land rights for the Garos in India, for instance suggests that the development of irrigation may

22 See Bolding, 2004:10.

well have been a factor triggering the process of privatization of land resources, a process that was biased in favor of men (See Agarwal, 1994:158). Schenk-Sandbergen and Choulamany-Kamphoui likewise draw attention to the fact that the male-biased land-titling program in Laos will “get priority in areas with irrigated agriculture aiming to grow a second crop” (Schenk-Sandbergen and Choulamany-Kamphoui, 1995:21).

The Marxist-inspired hypothesis and analysis of the linkages between gender relations and irrigation development has clear advantages to the more instrumentalist analyses of the liberal feminist approach of the *biases* and *participation* projects. Gender based inequities and injustices are not simply reduced (or seen as reducible) to male ignorance, or to the exclusion of women from formal, established decision making networks, but are analyzed in a broader framework of social relations of power. The adjustments in the organization of household labor that are provoked by irrigation development are seen as “mediated through patriarchal family relations and kin-age-based institutional structures of labor mobilization and resource access” (Carney, 1988a). The Marxist feminist analysis provides a historical understanding of gender inequality as it interacts with class oppression and imperialism, and gives an account of the world in which unequal gender relations are not seen a mere aberration from normality as represented by the developed world. Instead, gender inequalities are seen to be constitutive (a structural feature) of a ‘modern’ world which puts the profits of a few before the human needs of many. The Marxist feminist narrative attempts linking more narrow irrigation questions with larger structures of global economic exploitation, and tries bringing into focus the larger political economy which maintains the impoverishment of rural-based women. Indeed, such analyses may even make the recipes and strategies of the WID and participation schools appear rather empty and cynical in the face of stark global inequalities.

A drawback and disadvantage of a radical Marxist feminist approach is the obvious gap it entails between theory and practice. There are massive odds against the kind of structural (revolutionary) transformation Marxist and radical feminist’s analyses imply: reforms of land tenure systems and labor relations. Although both Schrijvers (1984) in her gender analysis of the Mahaweli irrigation system, as well as Carney in her various writings (Carney, 1986) made use of a Marxist-inspired framework of analysis, and included a sharp critique on the technological optimism of modernist irrigation development projects, their strategies for change were not so different from those of the *biases* and *participation* project described above.²³ And while several authors describe strategies of individual women resisting increases in male control over their labor and incomes, there are few documented cases of organized resistance by women other than the one portrayed in the BBC

23 In some of her later analyses and writings, Carney suggests that development initiatives that require substantial and continuous labor inputs like the Jahally Pacharr are unlikely to succeed (Carney, 1994), and that public investments in improvements of traditional rice agroecologies would lead to better outcomes, both for gender equity as well as for food security (Carney, 1991).

documentary of Sarah Hobson "The Lost Harvest" (1983), suggesting that the changes in land and labor relations induced by irrigation development have not caught the imagination of feminist groups or mobilized collective forms of struggle by women. In sum, the Marxist thesis offers an appealing analysis and critique of irrigation development, but does not offer many suggestions for alternatives.

Drawbacks in terms of analysis are first of all that the position tends to be rather deterministic and structuralistic. The analysis portrays women as victims of larger power structures, and leaves little conceptual space for understanding women's (and men's) own interpretations and lived experiences. The motors of change are, in other words, placed at a very high level of abstraction. Observable phenomena are interpreted as manifestations of the workings of combinations of patriarchy and capitalism, both of which 'move' according to their own laws of motion, almost unaffected by what (groups of) people do or don't do. The very concept of patriarchy is analytically not very precise, or at least there is little agreement on the level at which it operates. Is patriarchy a system, a set of structured social relations, or is it about individual men oppressing individual women? While radical feminists held the unsatisfactory position that men were the main enemy, the bearers of patriarchy, socialist feminists tended to do almost the opposite through what has been described as the 'traditional Marxist ploy' of removing the agents of domination from the scene, leaving behind only the blind workings of the capitalist system to explain women's oppression.

Another problem of the Marxist feminist analysis is the often assumed existence of more gender egalitarian societies in the past, in a past 'before (irrigation) history and before analysis', or in 'traditional' societies not yet 'touched' by history. Expansionist wars, colonialism and capitalism are the causal mechanisms leading to social and gender differentiation. This is overly reductionist in that it analyzes gender inequalities as the outcomes of larger historical and economic forces - of which irrigation is somehow an important element. This way of analyzing the origin of gender oppression is also problematic in an epistemological sense in that it presupposes some pristine and heavenly origin outside of discourse and analysis. It is also not clear what the precise role of irrigation is in this complex of forces. Is irrigation a rather arbitrary element, or is irrigation technology and knowledge an important carrier and enforcer of capitalist and patriarchal values - but then what characteristics of irrigation make it so, and can these be removed or replaced?

Eco-feminism(s)

A second possible critical explanation for the negative linkage between irrigation development and gender equity is that irrigation is part and parcel of a masculinist paradigm of water management, symbolizing control over nature and women. This view partly evolved from the lines of thinking developed by the feminist scholar Maria Mies, who fundamentally disagreed with some marxist feminists in their prioritizing of class as the 'primary contradiction'. Like Engels, Mies argued that the roots of gender inequality and female exploitation needed to be sought in the control

of female sexuality, fertility and productive capacities. Male monopoly over weapons and arms enabled men to use and abuse women. Mies nevertheless rejected Engels' thesis that social exploitation (and class and gender differences) are caused by the emergence of economic surpluses, and argued that even when no such surpluses were produced, there was violence and exploitation. Mies argued that the origins of human civilization do not lie in the hunting (of men), but in the productivity and inventiveness of women. Although hunting created bonds which enabled men to form more complex social relations, men would never have survived without women who through farming took care of providing staple food. In addition, women and not men were the first to develop farming technologies (Mies, 1988).

Mies further criticized Engels in his failure to grasp the importance of the fact that women and men acted upon their natural environment with qualitatively different bodies. Women, as the bearers of children and carers of the family, experienced their entire bodies as productive, not simply their arms and legs, heads and hands. As a consequence, women enjoyed a harmonious relationship between the nature of their bodies and the nature of their environment. Men, in contrast, unable to produce through their bodies, were forced to rely on tools in order to make productive contributions. The full exploitative potential of male control of the means of production became apparent with the development of livestock and agriculture and the emergence of economic surpluses. In the struggle to appropriate the surpluses for themselves, men's control over the tools of production allowed them to domesticate women, as well as animals, and to restrict them to the role of breeding children, particularly sons to inherit their wealth. Women became defined as nature, as part of the physical preconditions for male production. The predatory relationship between man and nature became the model for organizing his relationships with women and underpinned all subsequent developments. Its latest manifestation, capitalism, has been built on and interrelated with processes of colonization and housewife-ization, both entailing the consignment of large sections of humanity to the realm of nature, justifying their exploitation (Mies, 1988).²⁴

Mies's postulation of a women-nature link has become popular among quite a varied group of feminist scholars, who combine environmental concerns with feminism, ecofeminists. There are many streams of ecofeminism, but most ecofeminists advocate some form of an environmental awareness that deals with the twin oppressions of the domination of women and nature through an ethic of care and nurture that arises out of women's culturally constructed experiences. Or, in Carolyn Merchant's words: "My own approach is an ethic that treats humans (including male partners and female partners) as equals in personal, household, and political relations and humans as equal partners with (rather than controlled by or dominant over) nonhuman nature. Just as human partners, regardless of sex, race, or

²⁴ Naila Kabeer provides a more elaborate description and discussion of Mies' ideas. See Kabeer, 1995: 50-53

class must give each other space, time, and care, allowing each other to grow and develop individually within supportive non-dominating relationships, so humans must give nonhuman nature space, time and care, allowing it to reproduce, evolve and respond to human actions. In practice, this would mean not cutting forests and damming rivers that make people and wildlife flood plains more vulnerable to “natural disasters”; curtailing development in areas subject to volcanoes, earthquakes, hurricanes, and tornados to allow room for unpredictable, chaotic, natural surprises; and exercising ethical restraint in introducing new technologies such as pesticides, genetically-engineered organisms, and biological weapons into ecosystems. Constructing nature as a partner allows for the possibility of a personal or intimate (but not necessarily spiritual) relationship with nature and for feelings of compassion for nonhumans as well as for people who are sexually, racially, or culturally different” (Merchant, 1995:8).

While hardly explicitly referring to irrigation, the famous Indian eco-feminist and physicist Vandana Shiva has applied her eco-feminist ideas to water, in a chapter in her book “Staying Alive”, entitled: “Women and the vanishing waters” (Shiva, 1989:179-217). In this chapter, she describes drought and water scarcity and the exploitation of women as two effects of the same reductionist knowledge that ‘violates cycles of life in rivers’. Shiva posits the scarcity of drinking water and the problems this entails for women as one of the effects of irrigation development (Shiva, 1989:179). She ends her list of descriptions of severely water scarce regions and villages in India as follows: “The cause of the water crisis and the failure of solutions both arise from reductionist science and maldevelopment working against the logic of the water cycle, and hence violating the integrity of water flows which allows rivers, streams and wells to regenerate themselves. The arrogance of these anti-nature and anti-women development programmes lies in their belief that they *create* water and have the power to ‘augment’ it. They fail to recognize that humans, like all living beings, are participants in the water cycle and can survive sustainably only through that participation. Working against it, assuming one is controlling and augmenting water while over-exploiting or disrupting it, amounts at one point to a breakdown of the cycle of life. That is why in water management, it is imperative to think and act ecologically, to ‘think like a river’ and to flow with the nature of the water. All attempts that have violated the logic of the water’s natural flow in renewing itself have ended up worsening the problem of water scarcity. Water circulates from seas to clouds, to land and rivers, to lakes and to underground streams, and ultimately returns to the oceans, generating life wherever it goes. It is a renewable resource by virtue of this endless cyclic flow between sea, air and land. Despite what engineers like to think, water cannot be ‘augmented’ or ‘built’. It can be diverted and re-distributed and it can be wasted, but the availability of water on earth is united and limited by the water cycle. Since it is volatile, and since most of its flow is invisible, in and below the soil, it is rarely seen as being the element that places the strictest limits on sustainable use. Used within these limits, water can be available forever in all its forms and abundance; stretched beyond these limits, it

disappears and dries up. Over-exploitation for a few decades or even a few years can destroy sources that have supported life over centuries. Violence to the water cycle is probably the worst but most invisible form of violence because it simultaneously threatens the survival of all.

Dominant approaches to water utilization and management are reductionist and fail to perceive the cyclical nature of water flows. They linearize and commoditize thinking about water as a resource and create an illusion of producing abundance while manufacturing scarcity. The submersion of catchments and the diversion of surface water by large dams; the depletion of groundwater caused by diverting river flows as well as by over-exploitation made possible by energized pumping and tubewells; and the overuse of water by surface cultivation of water intensive crops and trees are some major causes for the drying up of water systems. Yet the crisis mind proposes an extension of the disease as the cure – its solution to desertification is more dams, more tubewells, more water intensive cultivation on the one hand, and more technology intensive solutions to the drinking water crisis on the other. Nature's natural flow is further violated, destroying the feminine principle and sustaining power of water, and destroying women's knowledge and productivity in providing sustenance." (Shiva, 1989:182-184)²⁵

The eco-feminist hypothesis is an appealing one on a number of grounds. It holds the promise of an alternative overarching explanation both for the exploitation of nature as for the exploitation of women. This makes it an attractive position for feminist environmentalists or green feminists, and probably explains its populist appeal and related mobilizing power. Eco-feminist narratives are strongly connected to (or maybe even rooted in) actually existing women's movements that mobilize women in protests against large water development projects (mostly big dams).²⁶ The eco-feminist critique is also useful and insightful at symbolic and discursive levels. It attractively links, at the level of 'words', irrigation development with gender inequality through the concept of 'control'. Early irrigation thinking can indeed be seen to be deeply bound up with a fascination to control and shape reality through the control of water. Large canal irrigation systems provide a near to perfect

25 The chapter "Taking the Waters" by Veronica Strang, in the book "Gender, Water and Development" (2005) also echoes this ecofeminist narrative (Strang, 2005).

26 See for instance Merchant (1995) for a description of some ecofeminist movements. The Chipko movement in India is a well-known example, as is the Kenyan Green Belt Movement of the Nobel Prize for Peace winner Wangari Maatai. Whether women mobilized in and through these movements do indeed call and consider themselves 'eco-feminists' or subscribe to eco-feminist ideas is debatable. It might also be that leading and prominent eco-feminists manufacture the presence of many women in protests and rallies to protect the environment as evidence of their own belief that 'women are closer to nature'. See also Janet Momsen (2004), in the chapter "Gender and the Environment" for a critical discussion of the linkages between women's movements and environmental movements.

symbol of power, control, supremacy and dominion and as such appear to represent an almost paradigmatic example of the ecofeminist thesis.²⁷

What I find interesting about the ecofeminist argument is that it draws the attention to the fact that irrigation problems are often phrased and conceptualized in 'control' terms: controlling nature (or water) through science and technology is what the modernist project of the irrigation profession consists of. Eco-feminism asserts that women are placed on the 'nature' side of the equation, the side that needs to be controlled for societies to develop and flourish. Men are placed at the culture side, together with irrigation. This association of irrigation with Culture (with a capital C) rings familiar bells: in history, Culture or civilization is often accompanied with sophisticated water works, such as in the examples of the Egyptians, the Romans and the Incas. The interpretation of irrigation as an intrinsically masculine manifestation of Culture, in symbolic opposition to feminine Nature, provides one potentially attractive explanation for the impossibility of female protagonism in irrigation, and offers important possibilities for a feminist critique of irrigation technology.

The ecofeminist analysis is however problematic in furthering the understanding of the linkages between gender equity and (irrigation) development at levels other than ideology, knowledge or discourse (such as through the work women and men do and gender divisions of property and power). The analysis also does not address how the historical and material realities of male and female farmers and resource managers of different classes, castes, or ethnic groups affect the ways in which they use and manage natural resources (cf. Agarwal, 1992). Such an understanding requires thinking across and beyond the stereotype bipolar hierarchies that automatically oppose men to women and nature to culture, and it requires an avoidance of essentialist and functionalist notions of gender differences.²⁸ The hypothesis of eco-feminists has, at least as far as I know, not been systematically explored in empirical studies. It relies for evidence on often romanticized stories about 'traditional' societies in which people live in harmony with each other and with nature. For instance, the idea that women are the 'traditional' users and managers of water, the repositories of water knowledge, an idea that is central to eco-feminist rhetorics, is not backed up with empirical information. Indeed, the ecofeminist narrative constructs women as beings that exist almost outside of culture and history, a construction that satisfies their need for a myth of origin, the state of nature, necessary to challenge modernist progress and to symbolize the loss of authenticity, degeneration and exploitation of Western society. Women's original and authentic identity is interpreted as an indication of a primordial truth which precedes and remains unchanged by history or the external world. Such a

27 This analysis in some ways echoes Karl Wittfogel's 'hydraulic hypothesis' about Oriental Despotism, a seminal example that asserted that irrigation necessarily leads to social stratification and a centralization of power.

28 Critical discussions of eco-feminist thinking are provided by Agarwal, 1992 and Jackson, 1993a and 1993b

construction is problematic, for “what is found at the historical beginning of things is not the inviolable identity of their origin; it is the dissension of other things. It is disparity.” (Foucault, 1984:79) Thus, and in line with my conceptualization of gender as outlined in the first chapter, women cannot be characterized in terms of essences, fundamentals or roots. Instead, what women are is always relative to the historically and socially specific social relations in which they live.

Thinking gender in irrigation

The studies produced in the last decades of the previous century have shown how irrigation knowledge - as embedded and disseminated through Engineering cultures and technologies - and irrigation development processes importantly shape the possibilities of different people to control water, irrigated land and other irrigation benefits. They have also shown that gender is one important axis around which the division of such control possibilities occurs, and even suggest that irrigation development may increase women’s work responsibilities without directly increasing their incomes. The different reviewed studies reveal that the precise form such processes takes depend on the prevailing context in which they occur, and more specifically on the existing intra-household organization of productive and reproductive activities, and on wider patterns of gendered divisions in responsibilities and rights that are related to culturally embedded ways of defining and performing gendered identities.

The chapter has categorized gender and irrigation studies in two broad categories of narratives. This categorization admittedly is overly schematic and fails to do justice to the amount of care and detail which with many of the reviewed studies treat their case material. The simplification does nevertheless serve as a heuristic tool in further clarifying my own approach to ‘seeing’ and conceptualizing gender and irrigation linkages. The first category is formed by the narratives that are useful and familiar to ‘practitioners’, or to professionals working to improve irrigation projects. They remain relatively faithful to the theoretical, epistemological and political premises of mainstream irrigation thinking. These narratives are clearly inscribed in a modernization project of development, and continue to adhere to the established way of knowing in irrigation, which is strongly positivist and often reductionist. The studies based on these narratives serve the feminist and political objective of showing that gender matters for irrigation, and identify ways to make irrigation development more beneficial for women. They are often aimed at developing practical strategies that help Engineers recognize and see women, or that lead to the inclusion of women in irrigation development processes. Yet, they have many shortcomings in terms of their understanding of gender and change and they display a highly diluted and therefore questionable form of feminism. Women

become visible only in the terms of the existing irrigation discourse, either as agricultural producers comparable to men, or as the discursive 'other' through the identification of a separate women's water domain that hardly has any linkages with the 'real' and male water domain. And gender equity is primarily defined in terms of opening up the irrigation possibilities that have been extended to men to women as well.

The second category consists of narratives that are more firmly inscribed in and committed to feminist agendas of social transformation and many of the studies based on these narratives provide a more careful and detailed analysis of gender inequities. They clearly place irrigation development in wider processes of change, and offer interesting ways of linking that which happens within households and farms to larger political and economic processes. In the end, however, the underlying hypotheses of this second category of narratives tend to either reject irrigation as a possible feminist road to development on the basis of its (intrinsic) patriarchal, capitalist and masculine characteristics, or approach irrigation as a rather arbitrary element in larger schemes of patriarchal and capitalist exploitation. This automatically qualifies further explorations into the gender politics and dynamics of irrigation development and management processes as unnecessary, or at least as something that has no priority on feminist agendas. Feminists' attempts to improve irrigation projects, in this view, are like 'treating cancer with band-aid'²⁹ and can only address the symptoms of women's oppression that are caused by much larger, underlying structures of capitalism, patriarchy and masculine discursive hegemony.

I find myself and the project of this thesis somewhat awkwardly situated between the two categories of narratives. Although I do acknowledge that there are tensions and controversies between the concepts and methods of gender analysis and those of mainstream irrigation professionalism, as well as between the intrinsically modernist project of irrigation development and the deconstructive tendencies of feminist and critical analysis, I reject the view suggested by some critical feminist scholars that irrigation and feminism are contradictory or oxymoronic. In fact, my project importantly hinges on, and indeed derives an important part of its legitimacy from, a belief that better, more feminist, irrigation futures are possible. In what follows in this last section of this chapter, I provide an attempt to start drawing the conceptual contours of this belief. It consists of the search for ways of linking the critique of the technological optimism, scientific positivism and theoretical humanism that are implicit in the more radical transformative feminist narratives of academics, with the more pragmatic and 'hands-on' solutions and analyses offered by the liberal and reformist feminist narratives of irrigation development practitioners. Rather than providing a new and overarching theoretical meta-narrative, I have embarked on this attempt through a

²⁹ "Treating Cancer with Bandaid?" is the title of one of the chapters in Naila Kabear's book: "Reversed Realities? Gender Hierarchies in Development Thought" (Kabear, 1995).

rather eclectic pulling together of inspiring concepts and theoretical notions around five major themes: (1) the possibility of representing and knowing, (2) the linkages between 'actors' and 'structures', (3) feminism and questioning gender and (4) technology and questioning irrigation; (5) water rights.

Situated knowledge

How does the above review guide and shape the attempt of this thesis to 'think' gender in irrigation? With the help of Sandra Harding's discussion of feminist epistemologies (Harding, 1986:24), the different narratives can be categorized in terms of their implications for producing truth statements about gender and irrigation. A first response to the question can then be identified as critically looking at the knowledge of Engineers (and planners), and to their designs and technologies as part of that knowledge. The 'weak' version of this response, as represented by the WID school and the more instrumentalist participation thinkers, has it that Engineers suffer from sexist and androcentric biases. These biases are correctable by stricter adherence to the existing norms of scientific inquiry, or to the existing procedures of irrigation design. Insights from gender analysis can be 'added on' to such norms and procedures, and make it possible for Engineers to see the world in an enlarged perspective because they remove the covers and blinders that obscure knowledge and observation. This is an attractive response, because what it says is that there is nothing fundamentally wrong with Engineers and their knowledge: they can more or less go on with their business as usual, although they need to get rid of their biases of perception. Harding has labeled such a response as *feminist empiricist* (Harding, 1986:24), and a major flaw of this response is that "its methodological norms are meant to apply only to the 'context of justification' - to the testing of hypotheses and interpretation of evidence - not to the 'context of discovery'" (Harding, 1986:24). Applying this to the irrigation world, one could say that the empiricist position only looks at the ways in which an irrigation system can benefit both women and men - at its context of use - without looking at how the design came about - its social construction. As a result, important sources of 'bias' remain unchallenged: those that have become embedded, implicit and invisible in 'normal' engineering routines and practices, and those that stem from established ways of knowing.

Both the more radical participation school, as well as some ecofeminisms, can be seen to adhere to different versions of what Harding has called (with, among others, Hartsock (see Hartsock, 1998)) the *feminist standpoint* position. "Briefly, this proposal argues that men's dominating position in social life results in partial and perverse understandings, whereas women's subjugated position provides the possibility for more complete and less perverse understandings. Feminism and the women's movement provide the theory and motivation for inquiry and political struggle that can transform the perspective of women into a "standpoint" - a morally and scientifically preferable grounding for our interpretations and explanations of nature

and social life. The feminist critiques of social and natural science, whether expressed by women or by men, are grounded in the universal features of women's experiences as understood from the perspective of feminism" (Harding, 1986:26). In irrigation, the participation thinkers can be interpreted to adhere to some weak form of standpoint thinking, because by consciously trying to include the perspectives and views of women in designing irrigation systems and in implementing irrigation projects, they hope to construct 'better systems'. Likewise, ecofeminism could be read as a stronger form of standpoint thinking, in that a feminist perspective on water would reject irrigation, and come up with non-irrigation solutions to solving problems of water scarcity. The main difficulty with the *standpoint* position is that it assumes the possibility of a women's or feminist's view or perspective. Such an assumption sits uneasily with the acknowledgment that what women are depends on the specific situation (time, place) in which they are situated, and with the realization that women's experiences are divided by class, race and culture. It is also problematic in the assumption that a woman's identity means that she speaks for women from a position of 'knowledge'. As for instance Spivak has argued: "The position that only the subaltern can know the subaltern, only women can know women and so on, cannot be held as a theoretical presupposition either, for it predicates the possibility of knowledge on identity" (Spivak, 1987, cited in Phoca, 2001). Spivak says that women must not assume the right to speak on behalf of other women on the grounds of a shared or common identity, because the assumption of such an identity consigns subjectivity to biological reductionism.

Such doubts as those articulated by Spivak, together with hesitations about the very possibility of representing women, lay at the basis of postmodernist misgivings that "perhaps 'reality' can have 'a' structure only from the falsely universalizing perspective of the master. That is, only to the extent that one person or group can dominate the whole, can 'reality' appear to be governed by one set of rules or be constituted by one privileged set of social relations" (Flax, 1986:17 cited in Harding, 1986:26-27). Such misgivings have nourished a profound skepticism regarding universal (or universalizing) claims about the existence, nature and powers of reason, science, language and the 'subject/self'. The implication for 'feminist irrigation knowledge' is the realization that there is not just one 'true' story about gender and irrigation, but that there are many different truths and realities, which each of them are true only in relation to the specific contexts to which they apply.

It also implies that there is not just one 'true' evolutionary historical axis of gendered irrigation changes. The gender and irrigation narratives presented in this chapter tended to interpret irrigation as one element in larger evolutionary processes of change, often with the construction of the pre-irrigation situation as the 'point of origin', and by taking the introduction of irrigation as the source of emanation of a process of development or modernization. In the spirit of post-modernism, I reject the positing of origins that this form of theorizing implies as an epistemologically problematic quest for a-historical and asocial essences. I do not think that irrigation development processes, or changes in gender relations, can be understood as

following one neat uni-linear evolutionary path the direction of which can be attributed to characteristics that are intrinsic to irrigation – or to male or female essences. Rather, processes of change occur along many different axes, in different directions, and with effects that are largely contingent in that they cannot be easily ascribed to a single (set of) factors.

This, however, I do not take to imply the impossibility of any truth claim, nor do I adopt an extreme relativist position vis à vis the truth. Instead, I take it to mean that all knowledge is situated, and that objectivity is about particular and specific embodiment (rather than about “the false vision promising transcendence of all limits and responsibility”). As I already explained in the first chapter, I am sympathetic to Haraway’s account of feminist objectivity, which is about partial perspective, about limited location and situated knowledge, and about a desire to be accountable and answerable for one’s knowledge claims (Haraway, 1991). With Haraway and many other feminists, I argue for “an objectivity that privileges contestation, deconstruction, passionate construction, webbed connections, and hope for transformation of systems of knowledge and seeing”(Haraway, 1991:191). Such an approach thus includes ‘expert’ knowledge as one of the areas around which contestation may occur in irrigation.

Structure and actor

Another important element of the search for reconciliation between practical engineers and revolutionary feminists lies in the critical examination of the widely proclaimed dichotomy between short-term practical solutions, reformism and liberalism on the one hand and longer term perspectives (exploring process and causality), transformative strategies and more radical feminisms on the other. Unlike what this dichotomy suggest, I think that the search for short-term and pragmatic solutions to problems of gender bias and exclusion need not automatically be opposed to, but can well be seen as *part of* longer term processes of more thorough feminist change that aim to alter existing and new gendered inequities and injustices. I do believe there is a point in calling some of the proposed strategies and projects of the WID and participation school ‘reformist’, because of the fact that the root of many gender injustices and inequities lie outside the narrow irrigation project context, for instance in the organization of society’s gender relations, in wider social and political structures or in the structures of irrigation thinking and knowledge. And yet, I also believe that the type of changes advocated by the reformist position may bring small advances, change a few minds, make a little space for future generations of women, create political consciousness and solidarity among the women involved, and reveal the nature of the gender problem by generating specific forms of resistance.

One way of seeing the dichotomy between reformism and radicalism is as yet another version of the classical methodological problem of the relation between actor and structure, a problem that refers to the different ways in which social theories

conceptualize processes of change and power relations with voluntarism on the one hand of the spectrum and determinism on the other extreme. The more determinist narratives of the Marxist and eco-feminist position tend to reduce women as well as irrigation professionals to *cultural dopes*, the ignorant victims of systems and structures of male domination and capitalism, whereas the more voluntarist narratives of the WID and participation schools risk falling into the trap of attributing too much agency and power to female irrigators – provided they are seen and included by Engineers.

What is needed is a theory that recognizes that both (male and female) irrigators as well as engineers are important actors in shaping irrigation realities, while at the same time admitting that their freedom of behavior is shaped and mediated by structural constraints. The writings of Long, Giddens and Bourdieu offer important ingredients for such an interpretation. These thinkers have developed theories of individual action as both enabled and constrained by social structure. Giddens' structuration theory adopts 'duality of structure' as a central concept: "Structure is the medium and outcome of the conduct it recursively organizes; the structural properties of social systems do not exist outside of action but are chronically implicated in its production and reproduction" (Giddens, 1984:374). Long explains his actor-oriented approach as an attempt to place individual choices and social relations within larger frameworks of meaning and action (Long, 1992). Such conceptualizations adopt a concept of human agency which recognizes human beings as knowledgeable and capable actors, and which see people as active players in (re-)creating their own social and material environments, even when they operate in contexts that are only partially of their own making and with motivations that are only partly conscious. Such theories, by implication, suggest that practical solutions need not necessarily be premised on voluntarist assumptions about human behavior. They also direct attention to the fact that it is what different actors in irrigation *do* (and don't do), their practices and everyday behavior and actions, that constitutes irrigation realities.

Seeing women or questioning gender?

To some extent, the emphasis of many of the reviewed studies reflects an important preoccupation of the feminist agenda of the time in which they were produced, which was to establish feminist concerns as topics worthy of the attention of (irrigation) development planners and engineers. The collected evidence was presented not only to contribute to progressive reforms in irrigation and development planning, but also to prove the general feminist point of the universality of women's oppression (which would, in turn, help to claim credibility and legitimacy as gender scholars). It was based on the political assumptions that there must be a universal basis for feminism, and that the oppression of women has some singular form discernible in the universal structure of patriarchy or masculine domination. Such theorizing has been widely criticized since, because of its

colonization and appropriation of non-Western cultures to support highly Western notions of oppression and liberation, and also because of their construction of a “Third World” (an “Orient”) in which gender oppression is explained as symptomatic of non-Western barbarism (see Mohanty, 1991 and Spivak, 1988).

However, the idea that ‘women’ exist as a category of people with important similarities in identities or histories – which is the “we are all sisters in struggle” corollary to the universal exploitation framework³⁰ – has been much more difficult to displace. Much thinking and theorizing of gender, also in irrigation, continues to be based on the assumption of the existence of something “‘specifically feminine’ “that is both differentiated from the masculine as such and recognizable in its difference by an unmarked and, hence, presumed universality of ‘women’ “ (Butler, 1999:7).³¹ As explained in more detail in the first chapter, I reject this belief in feminine essences and universalities. In my opinion, a feminist inquiry of irrigation consists not of the search for the origins of gender, nor does it need to be premised on the assumption of an authentic femininity, but instead investigates the political stakes in designating as an *origin* and *cause* those identity categories that are in fact the *effects* of institutions, practices, and discourses with multiple and diffuse points of origin. Rather than treating the ‘female’ or ‘women’ as stable notions, I approach them as socially constructed and relational terms. The feminist project in irrigation, in my view, precisely consists of continuously having to ask the question about the meaning of gender (or of the categories of women/men). It implies critically inquiring how irrigation discourses, development processes, technologies, infrastructures and institutions constitute and define gendered categories of identity, how such categories come to be seen and perceived as natural and objective, and how they guide decisions about the allocation of resources or about the organization of political representation.

Irrigation: the motor of or an arbitrary element in progress?

At the core of thinking about the linkages between irrigation development and gender lies the fundamental question of who (or what) is driving changes in the technology-society nexus. Is irrigation technology the agent of social change (irrespective of whether this change is seen as positive or negative) on account of its ‘invincible rationality’ (Shah, 2003:7)? Or is change happening almost irrespective and independent of irrigation technology, as the result of the actions and behavior of social actors or of larger social structures?³² The modernization and WID approaches tended towards the first view, and attributed quite some determining force to new irrigation technologies in shaping the emergence of new, modern societies. Some versions of the ecofeminist approach appear to be doing the same, although their

30 “Sisterhood is Global” is for instance the telling title of a book that appeared in 1984: “The International Women’s Movement Anthology” (Morgan, 1984).

31 See also Jackson, 2002:503-504 for a discussion on this problem of essentialism.

32 See van den Belt (n.d.) for a neat overview of discussions about how and why technology is social.

appreciation of the changes brought about by irrigation is much less positive. The Marxist feminist narrative, instead, adopted the second view. I reject the technological determinism of the first position, without nevertheless playing down the influence of irrigation in shaping people's behavior and choices to the same extent as the second one. I do this, as referred to already in the previous chapter, by adopting a sociotechnical approach.

In this approach, an irrigation system does not exist, ontologically, outside society. The system is, therefore, as much social as it is technical – and it can only be understood if the technical and the social are analyzed simultaneously (Bolding et al, 2000). The approach serves to contest the idea that technology development is just a matter of applying the right insights and natural (physical) laws to materials with the objective of constructing working objects (technologies) for particular purposes of use. Rather, it aims to open the 'black box' of technological objects by deconstructing them into their constituent parts, and by identifying and investigating the actors involved in their development with their different interests and perceptions. Such an exercise reveals that many of the characteristics of irrigation that tend to be seen as natural, or that are treated as givens, are in fact the product of conscious or less conscious choices of people.

For irrigation it is pertinent to apply the insights that technology is social beyond the design process and to also adopt a sociotechnical definition of the system-in-use. Many things 'happen' to an irrigation system once its design leaves the drawing board of the Engineer. All kinds of alterations and modifications are made, first of all during construction, but also later once the system is used. Such changes and modifications, as Bolding writes, are the result of different management configurations that a system witnesses over time: "a state operated scheme might be handed over to its users, a user operated scheme may be recaptured by the state. These changes do not come out of the blue, but are to some extent related to global and local changes in (policy) discourse. (...) Another feature of these schemes is that the users continuously rework and reshape (parts of) the object (the irrigation scheme) to suit their own purposes, e.g. through breaking gates and canals, expanding irrigated command areas in drains, tapping water illegally through pipes, etc." (Bolding, 2004:114). What is system *is*, therefore, in an ontological sense, is a question that cannot be answered out of the context in which the system is used. And, as Bolding adds, it can also not be answered in a once-and-for all way, because what a system is changes over time (Bolding, 2004:114). The word 'ontological choreography' appears to capture this shape-shifting character of irrigation systems (cf. Haraway, 2003:8). As I argue in more detail in the next chapter, this insight is of particular importance for allowing for the possibility of female protagonists in irrigation realities: where WID scholars, following Engineers, assumed that women were excluded from such realities, a redefinition of what the system consists of opens the conceptual and discursive door for women to become active co-shapers of and actors in irrigation realities.

Water rights and water as a contested resource

Further understanding and operationalizing gendered irrigation realities of irrigation systems-in-use importantly hinges on an unraveling of the meaning of water rights, since access to and control over water – water allocation and distribution – form the clearest intersection between irrigation, power and gender and because the most visible expression of gendered inequities in irrigation lies in the fact that formal rights and powers tend to be vested mostly in men, almost everywhere. Irrigation powers, at least at the users' level, most clearly become manifest and express themselves in control over water. And reversely, control over water is often one important ingredient of someone's (or a group's) social and political powers and status. A clear conceptualization of water rights, therefore, is a crucial entry-point for the analysis and understanding of gendered irrigation realities.

In many studies, rights to water tend to be rather simplistically conceived as something a person either has or does not have. Yet, in actual practice 'owning' water is seldom as straightforward as this conceptualization suggests. Water is not just fluid and flowing, which makes ownership difficult to define and apply. The type of authorization(s) a water right entails also requires further specification. Rights to water may either refer to (a combination of) rights to the resource itself, rights to the infrastructure and technology required to transport the water, rights to decide about water distribution, and rights to decide on who should have which rights.

In its most general meaning, a water right can be seen as the right that provides its holder with the authorization to subtract water from a particular source, including the particular social privileges and obligations that are associated with such authorization (Beccar et al., 2002). A water right can be seen to encompass three dimensions: a socio-legal dimension, a technical and an organizational dimension. The socio-legal dimension refers to the fact that a water right is an expression of agreement about the legitimacy of the right holders' claim to water. Such agreement must exist within the group of claimants, but it is equally important that rights over a resource be recognized by those who are excluded from its use. Agreement about the legitimacy of right holders' claim to water is intimately linked to social relations of authority and power, and can be based on a variety of grounds. It can be based on state legislation, water laws and regulations, but it can also be based on local rules established and authorized by traditions and community organizations.³³

Having the legal possibility (and social power) to take water in itself is meaningless without the two other dimensions of water control. First – the technical dimension – the adequate means (infrastructure, technology, and technical skills) to

³³ I have further elaborated this conceptualization elsewhere. See for instance Zwarteveen, 1997; Boelens and Zwarteveen, 2002 and 2003 and Roth et al., 2005. For similar conceptualizations of (water) rights, see Benda-Beckmann et al., 1998; Bruns and Meinzen-Dick, 2000; Gelles and Boelens, 2003.

actually take water from a source and convey it to fields must be present. Secondly - the organizational dimension - it is necessary to organize and manage not just water turns and the operation of infrastructure, but also the mobilization of resources and decision-making processes around these issues. Responsibility for these management tasks may either lie with government agencies, with NGOs or private companies, with community organizations or with a combination of those. Having a right to water often goes accompanied with the right-holders' possibility to participate in management decisions, and with a number of duties and obligations, such as the requirements to contribute cash or labor to the operation, maintenance and management of an irrigation system. When someone fails to comply with those duties, they risk sanctions such as the exclusion from one or more water turns or the payment of fines (Boelens and Zwarteveen, 2003, Gerbrandy and Hoogendam, 1998).

Because of the variable availability and fluid characteristics of the resource water, and because of the difficulties in rigorously monitoring and controlling water flows, there is a lot of scope for users at different levels to act in ways that diverge from distributional agreements as stipulated in state laws, regulations, infrastructural lay-outs, water distribution schedules and technologies. This is why the distribution of water is much less straightforward than that of many other resources, and it explains why water distribution is typically subject to continuous bargaining and negotiation, at all levels. Such bargaining may occur around the technical characteristics of the irrigation infrastructure, around the operation of the infrastructure, or about the very contents of the water right. Water distribution and control, therefore, cannot be understood by simply looking at the legal status of right-holders, nor can it be deduced from statutory law. Also an understanding of actual water use and distribution practices is required, including the different norms and discourses groups of users refer to when claiming access to, or simply taking, water. To allow for such differentiation, and thus to capture the difference between 'rights on paper' and actual water control and distribution, I suggest the following distinction of categories of rights: reference rights, activated rights and materialized rights (See Boelens and Zwarteveen, 2002; Roth et al., 2005).

What is important is that these different types of water rights have a meaning, and are negotiated and arranged, in different social domains of interaction, and that the norms and rules referred to may change depending on the particular domain (Mollinga, 1998; Krol, 1994). Across domains, and even within domains, the norms and rules that are referred to may have different origins and sources of legitimization - a situation referred to as legal pluralism. The question which rules and principles are to be considered (most) legitimate is often an intrinsic part of struggles over water. State laws may be challenged by representatives of local communities by referring to 'their own' traditional socio-legal systems. In addition, the rules, rights and duties attached to water are often closely linked to all kinds of non-water related rights and duties and are closely intertwined with economic and non-economic institutions and networks of social and political relations. In other words, definitions of rights, of relative claims, of appropriate uses and users are closely embedded, not only in

specific historical sets of political and economic structures but also in cultural systems of meanings, symbols and values (Gelles, 2000; McCay & Jentoft, 1998).

Linking women to the main canal. Mainstreaming gender in irrigation?

“Engineering is ‘the act of directing the great sources of power in nature for the use and convenience of man’ “. (Charter of the (British) Institution of Civil Engineers, 1828, cited in Ferguson, 1993)

...it appears that ‘equity’ as used by design engineers does not pertain to moral or social justice, but to production motives...(Horst, 1998:46)

In this chapter I describe and characterize conventional, professional bodies of irrigation thought with the purpose of exploring how women and gender can (or cannot) discursively ‘exist’ within and through them. I thus enter into a different region of what I have called, in the first chapter, the second irrigation world – the world of thinking about irrigation – . In the previous chapter I have visited a region of this second world that is mainly inhabited by gender analysts and feminist scholars. In this chapter I move to the region inhabited by Irrigation Engineers, a region with quite a different landscape. The main argument of the chapter is that ‘mainstreaming’ gender in conventional professional irrigation thinking is a dead-end road. Gender can be added as a variable to be analyzed as a categorical property of irrigating individuals and their behaviors, but the analysis of gender as social relations of power, identities and conceptual systems is intrinsically impossible. To ‘think’ gender in irrigation, therefore, alternative conceptualizations to the ‘mainstream’ ones are required.

I start, in the first section after this introduction, with a brief historical account of the roots of modern mainstream bodies of irrigation thinking. Many scholars have noted and investigated how the development of irrigation thinking was intimately tied to imperialist and colonial projects. Here, I discuss the genesis of ‘irrigation science’ in view of tracing some of its characteristics and understanding its particularities: its choice of metaphors, its major pre-occupations, its challenges and its practitioners. It is clear that these particularities can be partly attributed to the close affiliation of pioneering irrigation engineers with colonial administrators, and thus with their sense of an imperial ‘mission’. More generally, and as suggested in chapter 1, what may have influenced engineers’ methodological preoccupations and

theoretical choices (for instance their preference for mathematical formalism over the study of real problems), may have been partly shaped by the association of engineering with masculinity (cf. Oldenziel, 1999). Rather than further developing such affiliations and associations, I focus on tracing and unraveling the structures of thought that have come to characterize the typical Irrigation Engineers' mindset. How is the area of study delimited, which perspectives are adopted and considered legitimate, which norms are adhered to for the elaboration of concepts and theories?

I continue this section with a description and characterization of two important streams of thinking belonging to mainstream professional irrigation literature. I think it is possible to identify such a mainstream irrigation discourse, with particular ways of defining irrigation problems, a common pool of experts and a common stock of expertise. I use the description of this discourse to explore the terms of discursive existence for gender, and to discover how (if at all) gender can be thought within irrigation frames of thought. Important to this exercise is the assumption that irrigation knowledge, like most knowledge that is systematically produced, possesses regularities and exhibits systems of rules. These rules are, however, seldom formulated by the participants in the knowledge generating practices: they are not available to their consciousness, but constitute what Foucault once called the 'positive unconscious of knowledge' (cited in: Davidson, 1986:222). These rules are relatively autonomous and anonymous, and they make it possible to make claims that count as important, relevant or true within the boundaries of a science or discipline. My contention is that much of these unspoken rules in irrigation have to do with the isolation of the irrigation system from its social environment, and with the positioning of the knower vis à vis that what is (to be) known.¹

What I consider 'mainstream' irrigation thinking, and as a consequence my choice of texts representing this thinking, is heavily influenced by what I read, discussed, talked about and wrote while I worked at IWMI. It reflects thoughts about irrigation such as those presented in many IWMI documents, but also those of such institutes as the FAO, IFPRI and the World Bank. It also reflects my interpretation of the many talks and discussions I had with international irrigation professionals over lunches and dinners, and in meetings and conferences. It is a body of literature that is very closely linked to irrigation practice and interventions funded by international donors and national governments, and one that is dominated by the disciplines of engineering and economics. It is distinct and relatively separate (in persons and in ideas) from more academic writings on irrigation, such as those produced by historians, geographers, political and social

1 Diemer, in his study about irrigation in Africa, also characterizes and describes irrigation thinking. He considers irrigation knowledge and thinking as a 'paradigm', in a Kuhnian sense, and approaches what Foucault calls the 'positive unconscious of knowledge' with the help of Bourdieu's theory of practice - referring to roughly the same phenomenon as 'docte ignorance' or learned ignorance (Diemer, 1990:4-13). Chambers talks about the 'normal professionalism' of irrigation engineers and defines it as the thinking, values and behavior dominant in a profession (Chambers, 1988:68).

scientists. Rather than trying to understand the dynamics of irrigation development and reform processes, a main underlying goal of much of this mainstream work is to develop generic models, guidelines or principles that can inform irrigation planners and policymakers.² It might even be argued that much of mainstream irrigation knowledge was not developed for the sake of accurately representing irrigation realities, but for the sake of developing tools for designing irrigation interventions. Yet, in generating information and insight about what happens within irrigation schemes, mainstream irrigation knowledge does importantly shape thinking about and acting on irrigation problems.

With calling this international professional irrigation discourse 'mainstream' I do not mean to imply that it is uniform and static, nor that it is an uncontested body of knowledge and thinking. Mainstream irrigation wisdoms have always been contested, and continue to be challenged and disputed by various civil society groups as well as by water scholars. There exists a growing body of critical irrigation texts, which radically challenge some of the taken-for-granted assumptions of mainstream thought. Most of the theses, books and articles that have come out of the Irrigation and Water Engineering Group at Wageningen University in the last fifteen years are testimony of this. Rather than granting 'mainstream' irrigation thinking a strong hegemonic status, I use the word 'mainstream' to denote its widespread acceptance and status of 'normalcy'. Indeed, most produced knowledge about water needs to refer to it – whether in agreement or in disagreement – to be counted as knowledge, or to have an influence in debates and policies. As such, mainstream thinking forms one important point of departure for conceptualizing irrigation realities.

In the following section of the chapter, I identify and discuss a number of features and characteristics of the presented mainstreams of irrigation thinking that explain its resilience to feminist critiques, and that also explain why it is so difficult to see and analyze women and gender in irrigation. Basically these characteristics can be grouped in three broad categories. The first is related to the epistemological positivism of much mainstream irrigation thought, and of its overall lack of a critical interpretative tradition. The second group of characteristics has to do with the way in which irrigation systems are ontologically defined, and their boundaries drawn, and a third group of characteristics relates to the overall absence of power and politics from the analysis. I discuss these interrelated barriers to dealing with and questioning gender in irrigation.

2 See also Kloezen, 2002:9 for a short discussion of this literature.

Mainstream irrigation thinking

What today is understood as modern irrigation knowledge, and what belongs to the curriculum of contemporary irrigation professionals, has its roots in the attempts of colonial states such as France, the U.K. and the Netherlands to develop agriculture in their colonies. I start this section with a brief description of these roots, and of the birth of modern irrigation knowledge. During the 19th century and the first half of the 20th, the development of the scientific fields involved in irrigation (i.e. agronomy, hydrology and hydraulics) took a great flight as empirical knowledge and practical experience were accumulated throughout the world. Initially rather divergent conceptual 'schools' (American, British, French and Dutch) existed, linked to these nations' own efforts to develop and expand irrigated agriculture. Ideas on how to best regulate water conveyance and delivery processes varied, depending on the particular problems that were encountered in the field. After the second World War and with the end of the colonial era, irrigation science became much more international. Multinational development corporations and aid, together with the further development and dispersion of scientific knowledge gradually led to the emergence of an international irrigation knowledge base. International organizations, such as the World Bank, the Asian Development Bank, the Food and Agriculture Organization of the United Nations and the agricultural research centers of the CGIAR were (and still are) important repositories of this knowledge. The foundation of the International Commission on Irrigation and Drainage (ICID) in 1950 provides another clear testimony of the internationalization of irrigation knowledge, while its congresses helped to establish a global brotherhood of irrigation engineers.³

A main problem that keeps contemporary irrigation thinkers busy is the enormous gap between the potential and actual performance of irrigation systems.⁴ The search for solutions to close this gap is heavily informed by the widespread proclamation of two 'scarcities'.⁵ The first is the scarcity of public funds for investments in new irrigation systems and for operating and maintaining existing ones, and the second is the scarcity of renewable fresh water resources. The question of how water can be more efficiently used with less public funds is the central question that occupies the minds of many contemporary irrigation thinkers. Three bodies of thought can, in analogy with Mollinga's classification (Mollinga, 1998:12),

3 Among ICID members, the ICID is referred to as a 'family' (L. Vincent pers. com., 2004)

4 For descriptions and analyses of today's irrigation problems, see for instance Plusquellec et al., 1994; Horst, 1998; Frederiksen, 1996. Hervé Plusquellec, 2002 provides a neat historical overview of the debates about the poor performance of irrigation projects.

5 These scarcities are often treated as given in irrigation texts, justifying the continued search for ever more efficient technologies to use water. Yet, the scarcity of public funds is of-course not a natural fact, but the result of political choice. And though fresh water resources are undeniably scarce in large regions of the world, also this scarcity cannot be understood without questioning political water allocation priorities.

be identified as providing answers to this question: irrigation engineering, irrigation economics and irrigation management. Roughly, engineers continue to focus on 'getting the technology right' by means of rehabilitation programs and the introduction of modern technologies, economists focus on 'getting prices right' and the irrigation management school focuses on 'getting institutions right'. Here, I focus on the irrigation engineering and irrigation management schools.⁶

In what follows, and after the description of colonial irrigation, I briefly describe and characterize these two schools. In these descriptions, and in view of my objective of identifying the discursive terms of existence of women in them, I focus on their treatment of 'the social' and of human behavior. Interestingly, such a focus reveals that many irrigation discussions can be interpreted as centering around the question of how to deal with (or control) human behavior. I first describe the different ways in which *engineers* have attempted to close the performance gap. An important focus of attention in these attempts is the search for ways to either eliminate or incorporate human 'interferences' with the functioning of the irrigation system. Plusquellec et al., for instance, identify the question "How to minimize human intervention?" as one of the three important ones dominating the design of warabandi⁷ systems in India and Pakistan (Plusquellec et al., 1994:26). I then go on to describe ideas and solutions proposed by the 'irrigation management school'. Ways to foster and organize the participation of farmers in water management was an important initial focus of this school, which later expanded to include the examination of the relationships between agencies and irrigators.

I end this section with describing the conceptualization of an irrigation system as developed by Small and Svendsen (Small and Svendsen, 1992). The reason for doing so is that an important characteristic of *all* professional irrigation thinking is its 'system centeredness'; the irrigation system is at the center of the analysis. What matters to all irrigation professionals, indeed what defines the profession, is 'making the system work (better)'. As a consequence, how and whether human beings, 'the social' and thus women and gender can be thought in irrigation thinking crucially depends on how irrigation systems are ontologically defined and how its boundaries are drawn. How, of what, is the irrigation system constituted and what makes it work? The 'nested systems' definition by Small and Svendsen (Small and Svendsen, 1992) is one that I consider typical for much mainstream irrigation thinking.

The birth of modern irrigation knowledge

'Modern' irrigation knowledge is the knowledge that was developed over the last 150 to 200 years (Diemer and Slabbers 1992; Halsema 2002; Gilmartin, 1994 and 2003;

6 Elsewhere, I have written about gender and irrigation economics, see Zwarteveen, 1995. Also see Cleaver and Elson, 1995 and Green and Baden, 1995. For more general critical discussions of economic solutions to water problems, see Moore, 1989 and 1991; Perry et al, 1997.

7 A warabandi system is a schedule of water rotation that distributes the available water among irrigators by assigning them time-turns (see Berkoff, 1990).

Eggink and Ubels, 1984, Ravesteijn, 1997) and that has its roots in imperial drives to control the natural (and social) environment of European colonial states, most notably those of France, the UK and the Netherlands. The development of irrigation engineering as a specialized profession is likewise closely connected to the history of European colonialism, and to the US history of the American West. Whether in the United States or in India, “arid lands were the instruments of economic dominance, and irrigation its methodology” (Worster, 1985:150). The development of irrigation science can be characterized by a quest for rationality (or the desire to be scientific) and by a close association with ‘the imperial mission’, or the desire to bring civilization to hitherto uncivilized areas and societies. Existing irrigation works were seen as inferior, largely because they lacked the possibility for high degrees of regulation and control.⁸ As Diemer and Slabbers suggest, the disregard for existing irrigation practices also stemmed from the colonial engineers’ wish to clearly distinguish their own ‘modernity’ and superiority from the backward traditions and old-fashioned beliefs of ‘the natives’. How irrigation science came to develop is thus closely linked to the hierarchy between colonizer and colonized, or between ‘developed’ and ‘underdeveloped’ (Diemer and Slabbers, 1992:7).⁹

In the 19th and the beginning of the 20th century, engineering was a new profession and, like all engineers, irrigation engineers still had to establish their professional credibility (Ravesteijn, 1997).¹⁰ The main way in which modern colonial irrigation engineers distinguished themselves and clearly carved out their own distinct professional identity was by associating with science, and in particular mathematics. Status was also derived from the prestige of service to the state (Ravesteijn, 1997; Gilmartin, 2003). In the 19th century, measurement gradually became the defining feature of scientific engineering. The central quest of water engineers consisted in the design and construction of structures that maximized the productive work water could perform. And the moral imperative of irrigation engineering could be specified in relation to the natural tendency of water, like energy, to run to waste. Any water engineer, “should begin with the principle”, Bruno Latour writes “that if water can leak away, it will” (Latour, 1987:57-58).¹¹

8 The way in which Indonesia’s irrigation systems till today are classified still clearly reflects the colonial engineers’ preference for high degrees of regulation and control. The classification distinguishes between three categories of systems: ‘technical’ (teknis), ‘semi-technical’ (semi-teknis), and ‘simple’, a distinction is based on the degree in which (components of) a system can be measured, regulated and controlled (see Roth, 2003: 55 and Ravesteijn, 1997:4).

9 In this respect, it is interesting to note that Javanese irrigation was, by some engineers, called ‘wild’, in contrast to modern irrigation systems that were called ‘technical’, a labeling that mirrors and reifies a clear distinction between the rational engineers and the ‘noble savage’. (Ravesteijn, 1997:36)

10 Oldenzien describes the same phenomenon for US engineers in that same period, and shows how, in the process of establishing themselves as creditworthy professionals, engineers came to be constructed as masculine (Oldenzien, 1999).

11 Latour uses water control to describe the structure of scientific argument. The model of nature tending towards dissipation not only characterized scientific reasoning but it also guided the work of engineers. See Latour, 1987.

To achieve the goal of productive efficiency, water flows and uses were to be measured, mathematically modeled and ultimately *controlled*.¹² The study of processes of water conveyance and delivery were therefore central to irrigation science, and its main problems consisted of (1) providing enough water conveyance capacity in the canal network to irrigate the designated area, and (2) the regulation and division of water in such a way that it is distributed and delivered in a timely and adequate manner. A topic that was central to early efforts was for instance the prediction and accurate calculation of river discharges, on the basis of rainfall and topographical information. Also the design of hydraulic structures, such as those placed at bifurcation points in irrigation systems to either regulate the flow of water, control upstream or downstream water levels or to measure flows, was a major element of irrigation science.¹³

In order to 'make the system work' according to the new scientific principles (and thus according to the laws ordained by nature) not just water had to be controlled. The water also needed to be put to 'use' in the fields. To this end, farmers needed to be disciplined and controlled as well. They had to adapt their farming practices to the new scientific insights as embodied in new irrigation infrastructures. How to best control farmers was often a matter of debate and discussion. In colonial British India, administrators preferred relying on existing political networks and on existing local institutions to effectively rule the country. They preferred to leave field irrigation matters to be solved by local communities. Most engineers, in contrast, tended to classify customs and existing practices as 'backward' and believed that adhering to those would run counter to their civilizing project (Gilmartin, 1994:1136, Bolding et al., 1995). For Irrigation Engineers, the challenge was to eliminate as much as possible unwanted interferences by 'local communities'. Reducing the dependency of the system's survival on labor contributions from such communities was, in this perspective, an important achievement.¹⁴ 'Communities', in such view, needed to be removed from a world defined by 'genealogy', 'custom', and 'privilege', which bore no necessary relationship to the structure of irrigation networks, and to be encapsulated instead within the technical world of irrigation channels - and within a scientific discourse of 'efficient' control over nature (Gilmartin, 1994:1138). New irrigation roles of irrigators and the statuses associated with them, *achieved* as a consequence of purposeful and rational individual irrigation efforts, were preferable to their old roles and statuses which were *ascribed* by norms

12 Water was not the only problem. The prevention of silt accumulating in canals, and the design of a proper drainage system were also crucial and seen as belonging to the work of irrigation professionals.

13 The Romijn weir was one of the first products of Dutch irrigation science. It is an adjustable overflow structure (or a movable weir), that allows a rather precise regulation of the water flow by manually operating it. Such regulation, in turn, allows to more precisely adjust the amount of water delivered to the requirements of crops (Horst, 1998:24), allowing for a more 'rational' and 'scientific' way of irrigating.

14 Examples include silt control, which according to many Engineers was better, easier and more efficiently done if not dependent on community mobilization of labor.

and custom. The newly emerging irrigation societies were not just believed to be more efficient and productive, they were also more equitable than the old customs with their associated privileges for a happy few large landlords.¹⁵

The belief in the civilizing powers of irrigation clearly places irrigation in a tradition of modernization thinking. Design and construction of irrigation networks was not just technically challenging, it was also a crucial element in modernizing and civilizing underdeveloped and 'backward' societies. Many Engineers were strongly motivated to 'do well'; to help create better living conditions for 'natives' and to help prevent famines.¹⁶ The belief that irrigation would bring prosperity was rather straightforward, and sprang from the simple acknowledgment that large parts of the world were inhabited by extremely poor peasants whose agricultural production levels were far below technical optima and who lacked rain or access to some other water source.

Progress would come about through the 'liberation of Man from Nature' by means of an increase in the scale of production and productivity. Also, in addition to its capacity to generate higher yields per unit of land, irrigation would also spur modernization because its very design and operation required a degree of collaboration between farmers that would in itself have a civilizing effect.¹⁷ To those Engineers who shared this dream of irrigation systems as engines of progress¹⁸, users or irrigators existed in two major ways: as instruments and as targets of civilization efforts. Not coincidentally, the individualist and maximizing producer that was necessary for the success of the system was also the norm of modernity and rationality that had to be strived after. Both existentialities - that of instrument and of that of the target of civilization efforts - thus pre-supposed each other, and they

15 This negative view of communities is in line with ideas of such writers as Marx, Spencer and the early Durkheim who saw ongoing social changes as liberating humanity from the coercive and limiting world of the past. Those more critical of progress instead saw it as dissolving the ties that anchor humans to their milieu, providing a sense of selfhood and belonging. See Agrawal and Gibson, 2001 for a review of ideas about 'communities' in the management of natural resources.

16 The believers in the civilizing powers of irrigation included those who were critical of colonialism. Van Deventer, who in 1889 wrote a famous article in a Dutch journal in which he criticized Dutch colonial policy (called "Een Eereschuld") argued in favor of a more social colonial policy of which irrigation would be one of the main three ingredients (cited in Ravesteijn, 1997:11).

17 Gilmartin cites Willcocks, one of the most outspoken of British engineers in championing the new-found powers of professional engineering to transform the world. In Willcocks view, irrigation was the nursery of civilization: "The lessons of order and method are taught so thoroughly by irrigation, that it is not surprising that all ancient civilizations of the world had their birth in the irrigated valleys of the great old-world rivers (...) When hundreds and thousands of families had at first to learn the laws of nature, then apply them, and then live in accord with one another, in order to ensure the irrigation and drainage of their individual holdings, true civilization took its birth" (Willcocks, 1919:18, cited in Gilmartin, 2003). It is ironic that in the actual reality of many large scale irrigation schemes, control of farmers was achieved not so much through physical irrigation works, but through taxation, levying of fees and strict control of crop choices. Bolding (2004) describes and analyzes this for African and Zimbabwean irrigation schemes.

18 Not all engineers did share this dream. As already mentioned, in India some shared the belief of colonial administrators that field-level irrigation tasks were best left to local communities.

could also be addressed simultaneously through irrigation development. The proper, scientific, functioning of the irrigation system not only *required* a 'unitary' irrigator, it also actively produced it. The strong belief and hope that irrigation systems would indeed create 'modern farmers' that were very much alike in terms of their irrigation behavior, made the further study of social differences or farmer behavior and preferences unnecessary. Women likewise did not need mentioning. In the view of engineers, it would not matter if the new farmers were women – although it is fair to assume that not many imagined that to be a possibility. In their dream, the 'modern farmer' was a man, and one that mirrored their own masculinity. That this man was married and had children, and that he somehow relied on his wife for his own existence and reproduction, went without saying and did not affect or matter for the functioning of the irrigation system.

Engineering solutions

Most of today's engineering solutions to solving problems of water scarcity can be clustered under the heading of 'irrigation modernization'. The irrigation modernization school can, in many ways, be seen as the most direct heir of colonial irrigation schools. A general definition of modernization of irrigation is given by FAO: "A process of technical and managerial upgrading (as opposed to mere rehabilitation) of irrigation schemes combined with institutional reforms, with the objective to improve resource utilization (labor, water, economic, environmental) and water delivery service to farmers" (Burt, 1999:15).

Although what 'improvement' entails is not spelled out in this definition, it is safe to assume that it refers to an increase in efficiency which with the resources (water and public funds in particular) are used. Realizing more outputs with fewer inputs, that is what the irrigation modernization project is about. Avoiding the waste of water and public money may be an even more accurate way of summarizing it. 'Modernization' also embodies a notion of continuously pushing the limits of what is feasible and possible in terms of efficiency and efficacy through technological and managerial innovations. New technologies and management models set standards of what is achievable, and against which the current and progressive levels of performance can be measured and assessed. Irrigation water delivery is defined as a controllable natural-physical process that can be monitored and manipulated according to measurable and scientific performance criteria.¹⁹

Van Halsema (2002), introducing his study on irrigation modernization in the North West Frontier Province in Pakistan, describes in detail what the project of the typical modernization irrigation engineer consists of. I paraphrase and summarize

¹⁹ The Relative Water Supply and the Delivery Performance Ratio, both expressing actual water deliveries as a proportion of crop water requirements or planned deliveries, are two such performance criteria.

this description²⁰: In the design and development of ‘modern’ irrigation, the operational plan, with its specifications of how to manage and deliver the water, is the means to give shape to what should constitute a ‘modern’ irrigation water delivery service. The need to schedule and control the water delivery in better accordance with crop water requirements also defines how water should be managed. In the process, irrigation water delivery is defined as a controllable natural-physical process that can be monitored and manipulated according to measurable and scientific performance criteria. (...) The water distribution in the canal network is ideally to be controlled through a classic feed-back mechanism, in which the water delivery output is maintained near its target value for the duration of each scheduling cycle. The scheduling is usually regarded as a feed-forward water distribution mechanism to set the water delivery targets for each subsequent schedule cycle. The adopted scheduling principle largely determines the degree of accuracy with which irrigation requirements are met. Options for scheduling are not free to choose, but depend on: water allocation rules and principles, water availability, and the hydraulic capacity of the irrigation system. With the adoption of general performance criteria, water allocation, scheduling and distribution can be monitored and optimized. (Cf. Halsema, 2002: 13/14)

At the heart of the modernization project thus lie two important matters. The first is the scheduling of water, which can be described as frequency, rate, and duration of water deliveries at all levels within an irrigation conveyance system. The second concerns what Plusquellec et al. call “the determination of the interactive movement of various control structures to accomplish the desired schedule” (Plusquellec et al., 1994:23). There are different types of water delivery schedules, for instance rotation schedules, centralized schedules, arranged schedules and limited rate demand. Many traditional (that is not designed by engineers) delivery schedules (such as the *warabandi*, see Berkoff, 1990) are rotational and proportional. In the simplest form, a fixed flow rate arrives at a certain point on a calendar basis (for example, once every one or two weeks) for a fixed duration. The flow rate is fixed and rotated among various users on a lateral, distributary or tertiary canal until every user has received water. Water gifts are thus not matched with crop water requirements. Rather, farmers have to match crop choices and crop management with the scheduled water deliveries. New (‘modern’) irrigation projects are, in contrast, often built with the stated objective of delivering water according to crop water requirements. This objective implies a delivery schedule that allows for the adjustment of the frequency and duration of irrigations throughout the growing season in order to properly replenish the soil moisture as the plant matures and the weather changes. The continuously increasing accuracy in the prediction of water requirements of crops, culminating in the CROPWAT model, reflects the preoccupation of modernization engineers to precisely adjust water gifts to

20 “Modern water control in irrigation”, a World Bank publication of 1994, provides a good overview of the challenges of irrigation modernization. Page 6 of this publication lists 9 characteristics of a ‘modern’ irrigation system (Plusquellec et al., 1994)

productive needs. The second important concern of modernization engineers is the choice of water-control method and hydraulic equipment. The options range from relatively simple fixed upstream control with proportional dividers, to downstream control with automatic gates to pressurized systems with closed pipes.²¹ To many 'modernization' engineers, the challenge of regulating and controlling water conveyance and delivery processes requires a conception (and design) of an irrigation system as a highly predictable and controllable environment. Indeed, much engineering effort can be interpreted as an attempt to actually close or immunize the system of water conveyance and delivery from outside influences through for instance closed pipe systems and automated water control. Not all engineers, though, believe in the effectiveness of technocratic means of control, arguing that it leads to the 'paradox of operational flexibility': the higher the possibilities for regulation and adjustment to fine-tune water flows through the system, the lower the actual levels of predictability and water use efficiency. Thus, systems designed for high levels of control often achieve the opposite. As an alternative to increasing technical possibilities for regulation and control, Horst (1998) is among the engineers who argue for simplification and flexibility or for a water delivery and management system that can easily adjust to those changes in demand that always occur, but that are hard to predict. While Horst' plea was for relatively cheap and easy to operate structures and designs, others sought to increase managerial flexibility in more sophisticated technological solutions, basically by trying to match water deliveries in response to actually occurring variations by means of feed-back control and through the creation of enough buffer or storage capacity in the water supply system²² to accommodate variations in water withdrawal from the canals.

The provision of such flexibility at the delivery point (i.e. outlets and even farm-outlets) has the operational effect that the task of scheduling is decentralized to water users, thus (in principle) providing them with the option to accommodate their own objectives. Without the restrictions of centrally arranged irrigation schedules, this method also increases water users' possibilities to choose their own cropping patterns or irrigation application methods.²³ Among engineers, autonomy for irrigators and a downward shift in the locus of control are usually not discussed (or promoted) on their own merits, or in view of objectives of empowerment and participation, but evaluated against the goals of water use and irrigation system efficiency. Thus, the question whether or to what extent control of water scheduling and distribution needs to be centralized is a question about how to most effectively

21 Plusquellec et al. provide an overview of different operational concepts with their canal structures. The advantages and disadvantages of the different options are also given. (See Plusquellec et al., 1994:93-98)

22 This can be achieved through so-called in-line storage or through so-called off-line storage. Both possibilities make use of increased technological possibilities to control varied water supply and the regulation of buffer storage that rely on insights in the hydraulics of unsteady flow conditions.

23 See Plusquellec et al., 1994 and Halsema, 2002:24-25

and efficiently manage the system, rather than about happiness or satisfaction of irrigators.

How then, are irrigators treated and discursively constructed? Designs often focus primarily on the physical system, and are made taking into account the climatic conditions, the cropping pattern and the soil types. Social, political and economic contexts are not usually considered in a systematic way, although discussions about modern design options are replete with implicit and explicit statements about the needs and the behavior of farmers and operators. This behavior does, however, not belong to what needs explanation but is assumed and seen largely in relation to the design of the irrigation system, and more specifically to its operational requirements. Roughly, different types of designs are thus associated with certain 'human and institutional modalities for use'. These include for instance its staff requirements, the ease which with farmers can understand water division, the clarity and transparency of the operational procedures, the ease of operation, the need for measurements, the possibilities to tamper with the structures and the scope for corruption (cf. Horst, 1998:9-10).

It is acknowledged that different people have different perspectives on irrigation, but these differences are seen and explained as stemming from their different relation to the irrigation system rather than from exogenous factors. Horst identifies three major parties involved in irrigation practice; planners/designers, operational office staff and operational field staff and farmers (Horst, 1998). Svendsen and Small contrast the perspectives of farmers to those of agency staff (Svendsen and Small, 1990), and Plusquellec et al. distinguish between farmers, field operators, project managers, evaluators and designers/planners (Plusquellec et al., 1994). Farmers, who often continue to be referred to as men, are thus recognized as one identifiable and relatively uniform group who are expected to share important concerns and characteristics. Who they are and what they want is a direct function of their status as farmers in an irrigation system, leading to often rather essentialized and universal generalizations about what farmers want, or about what their perspectives are (see for instance Small and Svendsen, 1990). Their social context, alliances, networks and identities, their backgrounds and histories, their livelihood strategies and income sources, their cultural frames of reference and meaning are not seen to fundamentally affect their irrigation behavior. Gender is thus also inconsequential.

Management solutions: participation and accountability

Engineering and technological solutions to controlling water and people historically ranked highest on the priority lists of irrigation professionals.²⁴ Yet, people,

24 Chambers (in a chapter with the telling title "Man and Water") for instance wrote (in 1977): "To a remarkable degree, many writers on irrigation ignore and even appear unaware of the relationships between people and irrigation water. Attention is usually fixed on hydrological,

management and organization were not simply forgotten. As use of expressions like 'irrigation society' and 'hydraulic organization' suggested, strong causal links have always been assumed to exist between irrigation systems on the one hand, and social and economic relations on the other. Many irrigation texts reflected a form of technological determinism in the belief that 'modern' forms of organization would almost automatically follow, or even emanate from, 'modern' design. Forms of irrigation organization were not only required to make the system work, they were also believed to be generated by the imperatives of the physical system and its technology (cf. Chambers, 1980:47). Although not much explicit thought was devoted to it, a 'modern' irrigation organization' most likely had characteristics of the Weberian organizational ideal. These include for instance a complex rational division of labor, with fixed duties and jurisdictions; stable, rule-governed authority channels and universally applied performance guidelines; and a horizontal division of graded authority entailing supervision from above (Weber, 1964).

From the 1970s onwards, more explicit attention went into thinking about management questions in irrigation. Since mostly sociologists and anthropologists engaged in this exercise, it went accompanied with the entry of more social scientists into the professional irrigation community. An important objective of many of the first irrigation management texts was convincing irrigation professionals of the legitimacy of questions about 'the social' and about management. Thinking about, rather than just assuming, managerial and organizational questions had to be justified and defended to those who were used to see irrigation realities as primarily determined by 'the technical system'. To be successful in this regard, it was important that attention to managerial aspects was seen as contributing to established and accepted irrigation performance objectives; those relating to water efficiency and agricultural productivity. The World Development Report of 1978, for instance, attributed poor efficiencies to management weaknesses, stating that wasteful water management and poor maintenance were to be blamed in large part on the hierarchy of social relationships among farmers (World Development Report, 1978 cited in Chambers, 1988:81).

Intensive research and development work were undertaken below the outlet in large canal systems, while a lot of work was also done on communal or farmer-managed irrigation systems (also see chapter 5). According to the analysis of Chambers, first organizational irrigation studies were done in the tradition of anthropology, with a fascination for micro-detail and studying 'communals', small village level systems which were not parts of the commands of larger projects. Factions, farmers' collaboration and conflict, problems of water course construction

engineering, agricultural, and economic aspects. Especially in official documents it is rare to find described, let alone analyzed, the human side of the organization and operation of irrigation systems - the management of those who manage the water, the procedures for irrigation control, the processes of allocation of water to groups or individuals, the distribution of water within groups." (Chambers, 1977:340)

and maintenance, and water distribution, were studied.²⁵ Walter Coward, who pioneered in this field, saw three tasks as fundamental in the functioning of communal irrigation systems: the organization of water allocation; the organization of physical maintenance and the organization of conflict management (Coward, 1980:19). In the 1970s and early 1980s, more attention went into farmers' behavior in larger canal irrigation systems. Caste and conflict remained important concerns, but much else related to water distribution and appropriation was also studied. One widely accepted conclusion of this work was the need for improved farmer organizations in the local units of irrigation systems. Policymakers began to formulate strategies for the organization of irrigation groups, at various levels in the irrigation systems, which were intended to assume such responsibilities as completing and maintaining the local infrastructure, collecting irrigation fees from group members, settling disputes regarding water distribution, and coordinating the timing of planning and harvesting" (Coward, 1980:7).

Although the importance of bureaucrats' behavior was often mentioned, most thinking efforts went into (ways to control or govern) the organizational water behavior of farmers, instead of that of irrigation agencies and their staff (cf. Chambers, 1988). Uphoff, in a seminal book on the topic, called water users a kind of 'software' that was essential for making more effective and efficient use of the "hardware" of physical structures for the capture, conveyance, distribution and drainage of water (Uphoff, 1986). 'Participation' of farmers in operating, maintaining and managing irrigation systems was increasingly seen to be crucial. Conceptually, the main idea behind farmers' participation was that engineering, agronomic and economic objectives depended for their realization on the decisions and activities of farmers: "The benefits from irrigation are few unless the ultimate water users employ their own labor and capital in ways that make good use of available and anticipated land and water resources. (...) Farmers' considerations of benefit and cost must be taken into account because they control crucial aspects of irrigation system development and management" (Uphoff, 1986:3/4). Since farmers have better and more localized knowledge about their water needs and about local climatological, ecological and social conditions, they are best able to decide and manage irrigation at the lower levels of the system. From the point of view of those favoring bottom-up, participatory development approaches, the growing evidence about the disappointing performance of public irrigation agencies, together with the visible and increasing deterioration of the existing physical infrastructure were diagnosed as clear symptoms of the inherent inability of states to effectively and efficiently manage irrigation systems. Participation of farmers, from this perspective, was seen as part of a broader strategy towards decentralization and democracy, empowerment, and autonomy.

25 Some examples of early writings on irrigation management are Harriss, 1977; Wade, 1979; Merrey, 1983. Also the chapters in the book edited by Coward (1980), "Irrigation and Agricultural Development in Asia. Perspectives from the Social Sciences" provide a good overview of thinking about 'the social' in irrigation at that time.

In irrigation development efforts, the questions of how to secure adequate levels of farmer commitment, and of how to effectively design successful farmer organizations, became increasingly central. Freeman and Lowdermilk (1985) for instance explored a set of variables to do with organizational behavior. They were concerned with design of organizations to fulfill four irrigation functions: non-routine construction and rehabilitation; water allocation and drainage; system maintenance; and resolution of conflicts. Other writers and researchers followed this trend of social engineering, work of which the thrust was that if the (organizational) design is right, the organization will function.²⁶ Commonly advocated principles of institutional development clearly echo Weberian organizational ideals and include the desirability of clarity in boundaries for the resource-using group and of authority structures, the importance of a rigorous application of graduated sanctions against free-riders, and transparent decision making codified in written records (Ostrom, 1990). Productive and distributional concerns are generally identified as the primary incentives for collaboration and co-operation with institutional arrangements (Wade, 1987). Emphasis is usually given to formal manifestations of association, and to clearly structured arrangements for decision making often involving representation, regularization and formalization through contracts, committees and property rights.²⁷

Paralleling design discussions, irrigation management debates centered on the appropriate locus of control. Different writings can be seen to reflect different views on who should be given the powers of deciding on important questions of operation, distribution and resource allocation in irrigation systems. Should users and farmers be allowed to arrange water distribution and maintenance among themselves, or are these tasks better left with expert administrators and engineers? Or, as Coward wrote in 1980: "Perhaps the most serious institutional and organizational issues in irrigation development are those related to the articulation between water users and the irrigation bureaucracy" (Coward, 1980:25). Coward discusses some solutions to this articulation problem, based on empirical examples: "the Gezira solution, in which the water authority is given strong control not only at the project level but also at the farm level, and individual water users operate within a highly centralized management scheme; the Taiwanese solution, in which water users are represented at several levels of project operation through selected representatives; or the California solution in which water users form an association to purchase water wholesale from the central authority and retail it to their individual members." An additional solution Coward suggested is a Laotian one, involving the adaptation and incorporation of indigenous leadership roles for the achievement of satisfactory system-user interaction.

26 One example is Cernea and Meinzen-Dick, 1994. The book by Elinor Ostrom, "Crafting Institutions for Self-Governing Irrigation Systems" (1992) can also be seen in to fit in this social engineering tradition.

27 See for instance Bromley and Cernea, 1989, Ostrom, 1990 and Wade, 1987.

Two 'schools of thought' that can be seen as having influenced and continuing to influence thinking about participatory irrigation management are new institutionalism and thinking about common property management. New institutionalism derives theoretical insights from neo-liberal economics and political theory, and primarily focuses on the creation of (financial) incentives by markets and institutions so as to improve the efficiency of resource use. Thinking about common property management is rooted in the continuing debate about 'the tragedy of the commons' (Hardin, 1968; Bromley, 1992) which was revived by growing concerns about the environment. It tends to have a rather legal focus, and examines the prospects of community ownership and management of resources in the light of environmental sustainability.²⁸ Both theories share a belief in local institutions (often conceptualized as organizations) for increasing irrigation management performance. This belief is based on the expectation that institutions help formalize mutual expectations of co-operative behavior, allow the exercise of sanctions for non-co-operation and thereby reduce the costs of individual transactions. Social institutions are perceived as clever solutions to problems of trust and malfeasance in economic life as they can make cheating and free-riding too costly an activity to engage in (Granovetter, 1992).

More recent thinking has shifted the attention from the question of how to create sustainable water users organizations towards the relations of *accountability* between water users and the state (or other water providers), and within the state. Accountability is the extent to which the performance of all managers and staff having responsibilities at different levels of an irrigation organization is monitored and controlled by the water users (Uphoff et al., 1991). A lack of accountability is often identified as one of the key causes of low performance in irrigation systems. Merrey, for instance, states: "The fundamental problem is that while public organizations, under various forms of pressure, have agreed to share many of the responsibilities - especially the expenses and the hard work - of system management with farmer organizations, there is no significant change in the power relations between officials and farmers. Mutual accountability is absent. Officials have no incentives to foster independent WUAs. Farmer organizations remain dependent on the public organization, legally, financially and psychologically." (Merrey, 1996:1/2) The literature not just recognizes legal and political mechanisms for creating accountability, but also financial ones. A major identified source of distorted accountability has been identified in the way large - and even many small - irrigation systems are (or have been) funded. Many irrigation agencies in the world are (or used to be) dependent upon external donors to finance new construction and

28 In non-governmental and environmentalist circles, divesting the state of resource rights and management responsibilities is sometimes advocated as part of a critique of the modernising development strategies of centralised state and donor agencies, and of the dominance of 'western' technical over indigenous community perspectives (Shankari & Shah 1993, Sengupta 1993, Agarwal & Narain 1997). From this perspective, participation is advocated as a means to (re-) introduce or strengthen common property resource management in irrigation systems.

recurrent costs of irrigation, leading, among others, to a disregard of local farmers and users' needs and interests. The fact that irrigation agencies are normally dependent for their budgets on the central treasury, rather than on user fees, creates additional management anomalies. Since there is no direct link between the quality of the services provided by irrigation agency staff, and the amount they 'earn', they have no incentive to perform better. Instead, the professional rewards of irrigation managers in centrally financed, hierarchical agencies are best secured through conformity to higher authorities (Vermillion, 1991). *Cost recovery* and *financial autonomy* are central ingredients of the new-institutionalist solution to this problem (see Small and Carruthers, 1991).

A critical reading of irrigation management texts shows that much of it continues to be written from the perspective of planners and irrigation system managers. Participation of farmers and irrigators was (and maybe is) advocated primarily because it would help managers and planners to meet *their* objectives, as the following citations neatly illustrate: "The success of an irrigation project depends largely on the active participation and cooperation of individual farmers. Therefore, a group such as a farmers' association should be organized, preferably at the farmers' initiative or if necessary with initial government assistance, to help in attaining the objectives of the irrigation project. Irrigation technicians alone cannot satisfactorily operate and maintain the system" (Asian Development Bank, 1973:50, cited in Ostrom, 1992).

In line with most planners' ideals and objectives, participation in irrigation was mostly promoted on the basis of irrigation system-dictated imperatives of efficiency and productivity as formulated by engineers. Empowerment was also often mentioned as a benefit, but not much attention was given to its precise meaning, nor were participatory approaches in irrigation normally evaluated in terms of empowerment (in terms of whether they enhanced the capacity of individuals to improve their own lives, or in terms of whether processes of social change had been set in motion to the advantage of disadvantaged or marginalized groups). Indeed, as Sagardoy contended in discussing empowerment efforts in irrigation, "there is often no real intention of dedicating the efforts and resources that such programs will require" (Sagardoy, 1995:40). Instead, participation in itself was considered as empowering (cf. Cleaver, 1999).

Although the water users' community is (gender-)neutral and all-inclusive in theory, both in policy documents as well as in actual efforts to organize irrigators, the 'normal' participant or member often continued to be thought of and discursively constructed as an individual of the male gender. In fact, he still looked rather like the male irrigator of earlier colonial and engineers' discourses. This can be partly attributed to a tendency to delineate public decision-making as a male domain. With men and the masculine as the norm, attempts to think about and discuss gender questions depended on the establishment of women either as 'the exception', or as 'the other'. In the guidebook "Participation in Irrigation" of the World Bank, to give just one example, 'farmers' are mentioned as one identifiable

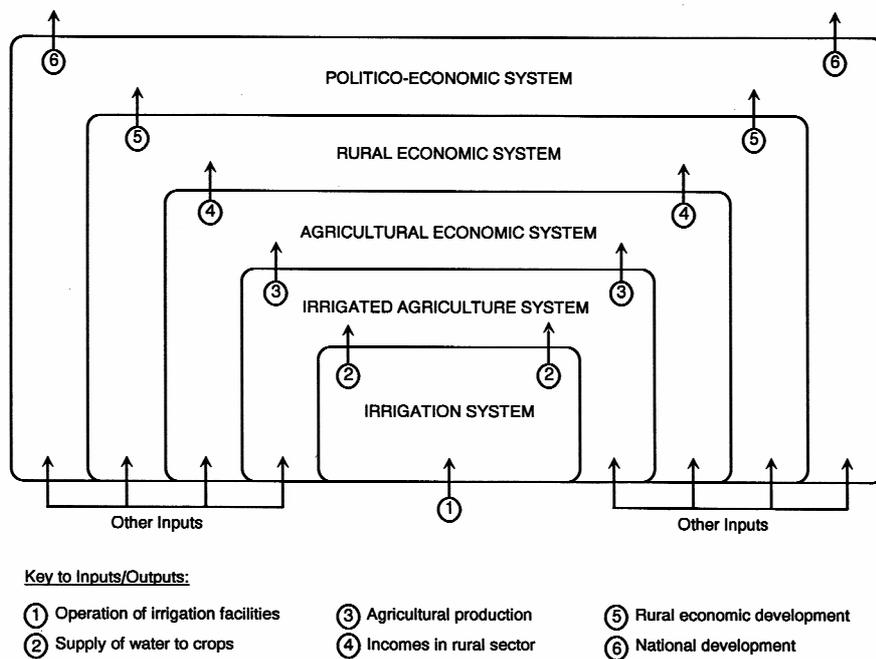
group with supposedly shared interests. Women and female headed households are mentioned separately, as 'special interest non-farm groups' and as 'marginal groups', respectively, together with 'other ethnic groups', or 'resettled farmers and tenant farmers' (Meinzen-Dick et al., 1995). Women can thus be made visible *as women*, with their identity as members or stakeholders being primarily defined by their womanhood. That women are *inside* for instance the farmer group, even when they do not head households, becomes difficult to acknowledge.

Also in the new-institutionalist analyses of accountability, gender is difficult to recognize as an intrinsic element of social relations, identities and systems of meanings. In these analyses, only those characteristics of irrigation actors are recognized that are deemed of value by new-institutionalist models of collective action and accountability. Social relations are, as a consequence, interpreted as being primarily determined by formal administrative hierarchies, institutional design principles and planned arrangements. As ideal-typical and rationalized relations, these are, by definition, removed from the worlds of custom, culture and tradition and from everyday politics and bargaining.²⁹ Such removal not only conceptually serves as a blinder to non-regulated behavior such as bureaucratic and political coercion and bribing, but it also makes it difficult to see and understand how gender matters and 'infects' social relations.

Systems

The definition of irrigation systems as 'nested systems' by Small and Svendsen provides a near to perfect illustration of how systems are conceptualized in much mainstream irrigation thinking as described above. In this an irrigation system is defined as "a set of physical and social elements employed (1) to acquire water from a naturally-concentrated source (such as a natural channel, depression, drainage-way or aquifer; (2) to facilitate and control the movement of water from the source to fields or other areas devoted to the production of agricultural crops or other desirable plants; and (3) to disperse the water into the root zone of these areas" (Small and Svendsen, 1992:3). Here, the physical refers to the infrastructure: dams, canals, control structures. The social refers to the institutions and actual behavior of the actors in an irrigation system. Below is a graphical representation of this conceptualization.

²⁹ In the words of Kloezen, they focus on operational and financial accountability, to the neglect of socio-economic and political accountability (Kloezen, 2002:13).



Source: Small and Svendsen, 1992

In describing the functioning of the irrigation system the metaphor of the machine or engine that produces something clearly shines through. "Like all systems, irrigation systems use inputs in various internal transformation processes that produce both intermediate outputs and final outputs. (...) The final output from the irrigation system (say the provision of water for agricultural crops) serves as an input into an irrigated agricultural system. Likewise, the output of this system (say, a sustained increase in agricultural productivity), is an input into a broader agricultural system. The output of this system (say, increased incomes in the rural sector) represents an input into a still broader rural economic system, whose output in turn is an input into the nation's overall development" (Small and Svendsen, 1992:4). What happens 'inside' this machine is treated as a given, and not influenced by its environment. What comes out of the irrigation machine - its outputs - is a mere function of what it has been fed in terms of inputs. In the graphical representation, the arrows only point away from the irrigation system to the agricultural system. What the irrigation system produces is thus seen as independent from its social and physical environment; it only depends on the way in which it is operated. (Interestingly, the operators sit somewhere in a no-man's land or vacuum). Disappointing outcomes and impacts can thus only be conceived as weaknesses in the infrastructural or managerial chain of command, rather than being used to question the hypothetical underlying performance mechanisms, the 'working' of the irrigation machine.

This conceptualization not only posits a very strong and clearly identifiable divide between the social and the technical, or at least between 'the system' and its environment, it also adopts the system, usually defined as the 'hardware' (canals

connected through division structures and outlets) as the norm for the social. How the 'irrigation machine' works, or should work, what it performs and how, is determined by its internal characteristics rather than by the environment in which the system is situated. Designing the 'system' requires objectification of data about the social and natural environment, rather than contextualization: it is based on (knowledge about) the universal laws of nature. The objectifying act should be done by experts. Through this act, and thus by appealing to science and objectivity, designs are effectively screened off from questions by 'non-experts' and from power and politics. In the process, the irrigation system itself also becomes a politically and socially neutral device (cf. Mollinga, 1998:11).

What it means 'to make the system work' is not usually spelled out in much detail in writings and debates. Most often it means that the irrigation system performs according to the expectations of the initial design, as stipulated in original project documents. For engineers, these expectations are based on rainfall and water availability data, in combination with a characterization of soil conditions and crop-water requirements. Most irrigation projects are designed on the premise that the technology of the system and its operation should be able to accommodate the varying water requirements of an assumed cropping plan. In other words, the cropping plan is the point of departure from design, and the technology and operation follow its (water) requirements (Horst, 1998:93; Halsema, 2002). As the arrows in the drawing show, all else is seen to emanate from the scientifically designed system. In fact, the direction of the arrows reflects the direction of much irrigation thinking: it starts with the physical system, the hardware, and the social, institutional and economic environment 'follow'. The social, in other words, is to be molded to the requirements of the technical system. The question of how to make the system work, therefore, is primarily a question of how - through which mechanisms - users or farmers can be made to 'do' what the system demands. Mainstream irrigation management thinking and irrigation economists have provided their tools and models to help answering this question (rules and contracts, property rights and meetings), but have not questioned the system as such. As is discussed in more detail below, this reflects the strong identification of many professional irrigation thinkers with policymakers, planners, designers and managers: the way in which the systems are identified, and the boundaries between the systems drawn, neatly demarcates perceived 'domain of influence' of irrigation professionals.

Seeing women in irrigation

That seeing women in irrigation is difficult is most often attributed to the symbolic and ideological construction of farmers, irrigators and engineers as masculine and to the fact that being recognized as inhabitants of and actors in irrigation worlds requires rights and abilities that more often belong (or are seen to belong) to men than to women. In addition to these relatively easy identifiable barriers to seeing women, there are a number of less easily recognized but perhaps equally fundamental conceptual problems in irrigation thinking that lead to mis-representing women, that prevent the questioning and challenging of gender relations and that mis-represent irrigation realities as gender-less or gender neutral. I have identified three sets of such problems.

A first stems from some of the more general features of irrigation thinking, such as its lack of a critical interpretative tradition and its cherishing of this lack as a virtue of modern science. These features are related to the positivist epistemological beliefs that guide much irrigation thinking. A second set of problems has to do with the way in which irrigation systems are defined, and how its boundaries are drawn. This shows in the choice of metaphors used for representing irrigation realities, metaphors that structure the world in oppositional dichotomies that are rather strongly associated with gender. It also shows in the ontological separation of the technical and the social, or between 'the system' and its context. A third set of problems has to do with the overall bracketing of power and politics from the analysis. This shows in the use of deductive methods and ideal-typical models, and in the direct association of much irrigation research with those who 'rule' irrigation systems. It also shows in the methodological individualism that characterizes much irrigation thinking, and in its narrow and rather functionalistic and instrumentalist concept of human agency. These three sets of conceptual problems are inter-related. In what follows in this section, I further discuss these conceptual barriers, and focus on their effects for representing women and thinking gender.

Power, perspective and knowledge

Although different in focus and scope, and although drawing on different disciplinary theories, the main streams of professional irrigation thinking as described in the previous sections share a number of characteristics. First, and importantly, they are visibly rooted in a colonial and imperial modernization project, a project that associates positivist science (and mathematics in particular) and modern technology with progress and civilization. Although most contemporary irrigation professionals no longer share the strong faith in technology as a motor of progress with their colonial ancestors, many continue to believe in the superiority – and universal applicability – of scientifically developed irrigation technologies or institutional and economic models. In this sense, mainstream irrigation thinking can

be seen to be firmly anchored in the Enlightenment tradition³⁰, a specifically modernist and Western tradition of thought. In this tradition, the 'god-trick' is pervasive: the assumption that one can see everything from nowhere, that disembodied reason can produce accurate and 'objective' accounts of the world.³¹ Enlightenment is marked by a faith in the neutrality of reasoned judgment, in scientific objectivity, in the progressive logic of reason in general and science in particular. Through the omnipotence of reason, transcendence is possible, allowing the knower to escape the limits of body, time and space.

The belief that, given the proper technologies, institutions or incentive structures, human beings will display the same irrigation behavior everywhere is rooted in the epistemological claim of human universality and homogeneity, a claim that is also associated with an enlightenment tradition of thinking. This claim has it that, in essence, all human beings are equal, and share a common capacity to reason. Differences between people are fundamentally epiphenomenal, making it possible to make generic statements about human nature, truth and other imperial universalities.³² In such a humanist or liberal understanding of human beings, as was explained in chapter 1, gender can only be thought of as an *attribute* of a person who is characterized essentially as a pre-gendered substance or 'core' (called the person). This is useful for some purposes, but not for the purpose of a critical feminist inquiry into the meaning of gender. Such inquiry requires a relational or contextual conceptualization of gender, suggesting that what the person 'is', and indeed what gender 'is' is always relative to the constructed relations in which it is determined (Butler, 1990/1999, Scott, 1986). In addition, and as feminist political theorists have pointed out, the referent for conceptualizing humanity and the human 'core' in liberal political theory has been primarily masculine. Indeed, the term *man* as used in liberal thought – even by those who are willing to concede that *he/him* means 'all' – is not simply a linguistic device or a generic label but a symbol for a concept reflecting both masculine values and virtues and patriarchalist practices (Dietz, 1992).

A related characteristic of much mainstream irrigation thought is its denial of the importance of power to knowledge. This denial of the connections between power and knowledge, and between the construction of subjectivity and power, may be considered logical in view of the fact that much mainstream irrigation knowledge is written from the perspective of those who (are deemed to be) in control: planners, administrators and managers.³³ Produced knowledge is aimed at helping *them*

30 This brief summary of the Enlightenment tradition is based on Hartsock, 1998:206.

31 The term 'god-trick' comes from Donna Haraway, see Haraway, 1991.

32 Mary Dietz, in an essay on feminism and theories of citizenship, elaborates on this liberal notion of humans as "atomistic, rational agents whose existence and interests are ontologically prior to society" (Dietz, 1992:80).

33 In other words, irrigation knowledge is written 'from the center'. Chambers referred to this as the 'center-outward, core-periphery' perspective (Chambers, 1988) Hartsock elaborates on the linkages between power and knowledge, and on the fundamental difference between theorizing from 'the center' and theorizing from 'the margins' (Hartsock, 1998:205-226).

realize their objectives, and enables them to speak more authoritatively through the disembodied, transcendent voice of Reason. Much early engineering thinking did in fact reflect an implicit juridical conception of power: the locus of control was situated with the head engineer, at the head-gates. He was the sovereign, and the irrigators were his subjects. While there used to be discussion about the most effective control strategy, the very possibility to effectively control and manipulate behavior of people and of flows of water and money was seldom questioned in irrigation knowledge. Contemporary theoretical models about how irrigation system performance is achieved, such as those embodied in technical designs or as proposed by neo-institutionalism, are likewise hardly ever empirically tested other than through the deductive method. Outcomes or outputs are measured against the expectations of the formal models, but the operational and behavioral assumptions of the model are seldom validated.³⁴ And designers are hardly ever confronted with operational realities at field level, while knowledge about designs is rarely tested against field level realities.³⁵ In this way, the belief in the model and thus in the effectiveness of planners' control mechanisms are not challenged, nor are the grounds for existence of the irrigation professional and his knowledge questioned.³⁶ One could even argue that the persistence of certain basic assumptions in irrigation thinking needs to be linked as much to its success in generating funds and power (and in bolstering the egos of irrigation practitioners), as to its success in generating valid theses about the determinants of irrigation system performance.

Such a view is in tune with the way in which much mainstream irrigation knowledge constructs knowers, and by extension head-engineers or managers, as transcendent rational subjects who exist outside time, space and context. Through irrigation knowledge, those (deemed) in control of water are provided with agency and subjectivity, a discursive construction that is conditional upon the simultaneous denial or severe limitation of agency to users, irrigators or farmers. The latter group is created as the 'Others', who are restricted in their capacity to act and speak, the ones that need to be controlled and whose behavior needs to be adjusted to what is deemed appropriate by the knowers. In the early irrigation literature, water users were frequently described as illiterate, uneducated and wasteful. Irrigation officials

34 Horst notes the "tenacious adherence to design standards (USBR standards in the Philippines) or principles (pursuance of 'technical irrigation' in Indonesia)", resulting in continuous repetition of the same type of design containing the same shortcomings" (Horst, 1998:79). Mollinga and Bolding note and comment upon the tendency in the professional irrigation world to think in terms of 'models' (Mollinga and Bolding, 2004: chapter 1 and 10).

35 This is a frequently mentioned reason to explain that there is little progress. Plusquellec et al. for instance state that many irrigation systems are characterized by 'dual personalities', "the first is the nominal system that is assumed to conform to the design and norms of operation, and the second is the reality of its operation. The nominal system is rarely adjusted to the changing economic, social and technical reality." (Plusquellec et al., 1994:1)

36 Empirical studies of irrigation realities 'in the field' provide a much less optimistic account of the controlling powers of head engineers and managers. See for instance Halsema, 2002; Mollinga, 1998; and Oorthuizen, 2003.

and field workers were also often talked about in pejorative terms, as being unmotivated, poorly trained and corrupt.

All this is not to deny that the call for more participation of farmers in design and management processes, and the associated increased appreciation of the value of farmers' knowledge, have resulted in serious questions about the legitimacy of irrigation knowledge claims. Also the hegemonic superiority of engineers' knowledge and their exclusive claims to the ability to design irrigation systems has been challenged. Yet, and as Shah convincingly argues, "while inclusion of farmers' knowledge and farmers' choices in the process of 'design' is envisaged by the dominant model, the validity of conventional disciplinary - scientific and engineering - knowledge and the context in which this knowledge is generated, is not very frequently questioned" (Shah, 2003:22). Issues of power and identity, of location and time, thus continue to be shielded off from scrutiny through appeals to 'the technical', 'the rational' and 'the scientific'. Irrigation knowledge continues to be, as Harding calls it, "part of the labor of 'ruling' (Harding, 1986:76). In this sense, efforts to foster more participatory forms of irrigation management cannot be understood without understanding the place of 'local community' and 'local knowledge' within the discourse of power and knowledge supporting the political system (cf. Gilmartin, 1994, Bolding et al., 1995). And although the more recent irrigation management literature is much more positive about farmers' knowledge and abilities, the agency they are accorded remains limited. The concept of human agency that is often used is that of the utility optimizer and rational decision maker, weighing the costs and benefits of alternative choices. There is not much conceptual scope for consideration of the actions and choices of the various players in irrigation from their own perspectives and in their own frames of reference. Nor are culture, tradition and less seemingly rational explanations for behavior allowed for.

Where Small and Svendsen's definition posits the ontological separation between the technical irrigation system from its social environment, the insight that the boundaries between the two are less easy to draw, prompts a definition of an irrigation system as a sociotechnical system (Mollinga, 1998). An irrigation system is constituted of *both* the social and the technical, and the two are inseparably intertwined. Irrigation technologies are not just deeply social because they require a specific social organization and specific irrigating behaviors to run smoothly. They are also social, because their very design and development are social processes in which different stakeholders interact. The nature of that process and the different perceptions, interests and powers of the stakeholders involved shape the design choices and the technical characteristics of the ultimate designs. The importance of this insight is that it allows questioning irrigation designs and designers. The design, or the technology, (the 'irrigation machine') as well as institutional models stop being the norm, dictating the behavior of users, operators and managers. And technical engineering or other expert knowledge is no longer granted highest status in conceptualizing irrigation realities (cf. Shah, 2003).

Gendered metaphors and dichotomies

The ways in which boundaries are drawn in much mainstream irrigation thinking is informed by a powerful spatial imagery with rather strong gender connotations. For one, irrigation systems and what goes on within them are often seen as 'the work place', a domain or area that is spatially and socially distinct from 'the home'. It is the place where production for the market occurs (and where incomes are earned), separate from the place where consumption and production for own use happen. Secondly, the irrigation system is also the place that is labeled as 'public', in implicit contrast to the 'private' location of home and family. For a long time, the public world of work and production tended to be seen, and used to be ideologically constructed, as the world of men. Such construction rested on normative ideas that men should be the breadwinners and principal income earners, whereas women should be carers, cleaners and mothers. And it was reinforced by a widespread and strong ideological connotation of the word farmer (and in analogy the word irrigator and the word engineer) as symbolizing male identity. While most irrigation thinkers today would not longer explicitly adhere to such gender ideologies, the conceptual language and methodological tools used continue to be pervaded by the dichotomies of work and home, production and consumption, public and private. What matters to irrigation professionalism is what happens in the former, in the world of work, production and public politics. This world is seen as relatively disconnected from and unrelated to the private world of care, consumption and intimacy. The irrigation world, in analogy, is also seen as the domain of reason and logic, in implicit contrast to the domains of emotion and affection that characterize the non-irrigation world.

A number of influential images are associated with the use of these dichotomized metaphors. An important one is the picture of irrigators as industrial workers whose working places are socially distinct and separate from their homes. Depending on the degree of autonomy granted to irrigators, they are either seen as factory workers or as private entrepreneurs. Irrigating and irrigated farming are, as a consequence, seen as the business of one individual whose irrigation behavior is primarily informed by irrigation system related imperatives. Other family members do sometimes assist this individual, but he (most often the individual is seen as a man) is the one to be in charge and to make all decisions. This view is problematic, since smallholder irrigated farming often is not the sole affair of one individual but a family undertaking. It is also problematic because it is implicitly based on a, by now much criticized, nuclear family household model³⁷, and because of its assumption of

³⁷ In this conceptualization, households are formed by men and women who come together in marriage because of their complementarity in biological reproduction (Becker, 1973). Once formed, the household behaves 'as if' it was maximizing a joint welfare function. It combines purchased goods and services with domestically available inputs, primarily family labor, to produce a welfare-maximizing bundle of Z-goods, the object of final consumption (e.g. health, nutrition, child services, warmth). The allocation of family labor time between competing uses is determined rationally by the principle of comparative advantage so that each household member specializes in those activities which give them the highest relative returns (cf. Kabeer, 1991). See also Agarwal,

clear-cut boundaries between the sphere of work and that of home. Positing such boundaries places households outside of irrigation realities, and outside of what needs to be explained by irrigation knowledge. Since the household is seen as the domain of women, further thinking about women and gender also becomes unnecessary.³⁸

From the perspective of irrigators and farmers, home and work are often closely interconnected, both in the fact that the first objective of work often is family survival, but also because family circumstances and considerations importantly influence work decisions and behavior. Indeed, the boundaries between public and private, as well as those between production and subsistence, blur on closer examination. And work and genders are not so easy to categorize in two distinct domains, nor are these domains necessarily in harmony (or in conflict, as some feminist scholars have it). Most smallholder farm households display a high degree of interdependence between production and subsistence activities, and between the household's farm functions and its family functions. Domestic (or reproductive) labor is characteristic of all household members' activities, across agricultural as well as subsistence production, and is not restricted to women's work. And irrigating and farming are not just about production, and not just associated with the activities of men.³⁹ Also, the intra-household organization of livelihood activities is not just characterized by complementarity and cooperation, but also by conflict and competition. Rethinking the meaning of 'private' and 'public' and, perhaps more importantly, reconstructing the relationship between the two because they are in part defined by each other, is therefore central to the feminist project in irrigation.

The dichotomous metaphors infect irrigation thinking also in more diffuse ways, through associating masculinity with all that matters to irrigation in implicit opposition to femininity with all that is less relevant.⁴⁰ Hence, water for productive uses tends to be considered as more important than water for domestic uses, crops

1997a; Folbre, 1986; Hart, 1992 and O'Laughlin, 1999 for discussions of conceptualizations of the household.

38 Early work on the roots of sexual oppression in anthropology found its basis in the domestic/public divide (cf. Rosaldo, 1974). The corresponding political agenda located women's emancipation in breaking down the barriers between the domestic and public domains.

39 Placing the irrigation system in the productive and public sphere, and conceptually separating it from the domestic and subsistence sphere, is not just analytically problematic. It has important political and distributional consequences in guiding plot and water allocation, and by designating specific users and uses of water as legitimate, and others as less important or even illegal. A question that is now receiving much policy attention is, for instance, the artificiality of the divide between water for productive and for domestic use when both are taken from the same irrigation system (cf. Bakker et al., 1999).

40 Hélène Cixous invokes the following polarities to illustrate that the hierarchical dualisms embedded in Western culture are related to the couple man/woman; "Activity/Passivity, Sun/Moon, Culture/Nature, Day/Night, Father/Mother, Intelligible/Sensitive, Logos/Pathos (Cixous and Clément, 1986:63). From her viewpoint, the very structures of reason are imbued with gender hierarchies, since reason inheres in a system that subordinates women and all that has traditionally been linked to women: passivity, nature, emotion, and bodily processes.

grown for the market are more important than subsistence crops, and public decisions are more important than private decisions. Also, economic and productionist incentives for behavior are considered more real than, and normatively superior to, those based on emotions, solidarity and affection. Work such as cooking and the provision of meals for agricultural laborers is not normally considered part of irrigation work. And the irrigation conflicts and struggles that are most easily observed and named tend to be of the spectacular and violent type, involving stealing, fighting and bribery. The more hidden everyday forms of resistance (cf. Scott, 1985), the silences and strategic invisibilities (cf. Jackson, 1998a) tend to receive less attention. Hence, while often not directly gendered, the conceptual delimitation of what counts and matters in irrigation, of what belongs to the irrigation domain, and the definitions of what is 'good' irrigation behavior are deeply colored by gendered images and connotations. Using such delimitations and definitions may have the effect of reinforcing and further legitimizing such gendered divides, rather than questioning them.

What all this means is that a proper understanding of gender within irrigation systems is crucially dependent on a thorough re-thinking of the metaphorical and spatial (and sometimes ideological and normative) images used. It is crucial to overcome, or at least critically question, the dualistic conceptual framework founded upon an opposition between the economic, rational irrigation world of production and politics on the one hand and the affectionate and emotional world of the home and the family on the other. This can, for instance, be done by recognizing the subsistence and livelihood functions of farms. It can also be done by recognizing that men are not just irrigators and farmers, but also husbands and fathers. Or by acknowledging that women's identities are not confined to those of mother and (house-) wife, but also often include those of farmers and decision makers. It includes allowing for the possibility that important irrigation negotiations occur in the domestic domain. And it requires a critical revisiting of what is recognized and defined as irrigation behavior, and of who are recognized as irrigators, for what is included in these definitions may well in itself be gendered. Rather than a priori assuming the meaning and boundaries of irrigation systems and households, and the criteria for inclusion in the irrigation world, these should be made the object of inquiry. How do different water users, managers, politicians and others define 'inside' and 'outside' of the system? Who is seen to 'belong' to the system, and in what way? Are these terms negotiable, and are definitions and conceptual categories themselves a way of defining and reconfirming ideas about gender, and of distinguishing masculinity from femininity?

Technical systems and boundaries

In much of today's irrigation thinking, the colonial view of farmers as backward and in need of civilization no longer is very popular. Yet, much thinking is still pervaded with an implicit normativity regarding what is 'good' and what is 'bad' irrigation

behavior. In fact, much irrigation knowledge is more concerned with creating the conditions and teaching people the skills for functioning as desired, than with understanding what is actually going on. Maybe as a result of this, people tend to 'matter' (and exist) in irrigation thinking only in so far as they functionally relate to the irrigation system as conceived in technical designs and management models. In the conceptualization of Small and Svendsen, this shows in the fact that only the behavior and tasks that are directly related to irrigation are considered. Or, "farmers are considered in their roles as irrigators, but their parallel roles in other aspects of crop husbandry are excluded" (Small and Svendsen, 1992:4). This distinction, as the authors explain, "is necessary to establish a clear analytic separation between the irrigation system and the broader agricultural system of which irrigation is a part" (Small and Svendsen, 1992:4). While such a conceptualization, according to the authors, does not deny the fact that all individuals in irrigation play many roles simultaneously (Small and Svendsen, 1990:388), it does rest on the Weberian assumption that individuals can and do consciously separate their irrigation roles and behavior from their other roles. Or at least it suggests that for understanding irrigation realities, a restricted focus on the behavior of users that directly relates to the outputs and impacts of the irrigation system is sufficient. Who farmers are thus only matters as far as their irrigation identities are concerned, the identities they have, as it were, achieved because of their rational involvement in the system. Therefore, and unless irrigation roles are directly gendered (that is, if being a woman or a man in itself is seen as an irrigation role), gender also ceases to matter.

Such conceptual insulation of the irrigation system from its environment mirrors the above described attempts of some irrigation engineers to immunize the irrigation system from outside interferences. It can, in fact, be seen as an attempt to achieve what technology scholars call a process of 'closure' (Latour, 1987; Bijker, 1993). Closure is achieved when the possible meaning and use of the technology is no longer contested, and its origins ascribed to the laws of nature. One of its effects is that the authority to make truth claims on irrigation comes to lie with experts. It is also another illustration of how the irrigation system is metaphorically compared to a factory or work place. The very concept of 'role', as used by Small and Svendsen (following Coward's (1980) framework) portrays irrigation realities as factory-like settings with strongly pronounced normative definitions of expected modes of conduct. What these roles are is taken as a given, and derived from an ideal-typical model of how the irrigation system should function. As Giddens remarks about the role concept: "the script is written, the stage set, and actors do the best they can with the parts prepared for them" (Giddens, 1984:84). Again, *who* plays these irrigation roles and in what social context does not matter. What people do in the irrigation factory is conceptualized as a function of the factory, and unrelated to who they are or to their status, position or power outside of the factory. Their gender, as a result,

is also inconsequential for the understanding of the functioning of the irrigation system and therefore does not require further looking into or questioning.⁴¹

There are an increasing number of studies showing that in day-to-day irrigation realities, the boundaries between the system and its environment are not so easy to draw. In actual irrigation life, people cannot easily set aside their non-irrigation related functions and interests for the sake of the good performance of the irrigation system. Also, people's irrigation decisions are not just stemming from considerations that are internal to the system. More often, irrigating farmers know each other and relate to each other in many more ways than just through sharing a joint irrigation facility. Irrigation decisions are tied to and influenced by wider choices related to farming, livelihoods and social networks.⁴² A clear gendered example comes from the study done by Charlotte van der Schaaf of a farmer managed irrigation system in Nepal. She describes the case of a widow whose access to irrigation water, in the absence of formal rights, became directly dependent upon the benevolence of her family-in-law. For various reasons (one of which was the fact that she only had daughters), her in-laws were not very accommodating and made it physically impossible for her to irrigate her land by letting the part of the canal leading to her field deteriorate (Schaaf, van der, 2000:174-177). The next chapters of this thesis provide some further examples of how what happens 'inside' the irrigation system can only be explained by referring to what happens 'outside' of it.

What these studies suggest is that an irrigation system is *embedded* in wider social and political relations and hierarchies that are not (all) based on or derived from water. Irrigators belong to wider cultural and normative systems, and are informed by locally specific ecological conditions. Recognizing embedded-ness opens the conceptual door for the recognition of gender: because all social and political environments are gendered, gender shapes and colors all irrigation interactions and irrigation decisions.⁴³ The work of Giddens and Long can assist in

41 Gender itself can of-course be seen as characterizing one (set of) irrigation role(s), namely that of women. This can for instance happen when the inclusion of women in water users' associations is stipulated in policies. An illustration of this is provided by Van Koppen et al. who describe the different types of members at the lowest organizational level of the West Gandak irrigation system in Nepal. Next to for instance a chairman and a vice-chairman, a woman is mentioned as one type of member (van Koppen et al., 2001)

42 Some clear examples of embeddedness are provided by Roth (2003) and Oorthuizen (2003).

43 The fact that most accounts of embedded realities of water management do hardly mention gender may be due to the fact that many of these studies describe and understand irrigation situations in the terms used by irrigation actors themselves, and uncritically accept their gender connotations. Most studies also uncritically adopt either the locally vigilant or conventional methods for identifying relevant actors. Hence, where farmers, irrigators and water leaders in the local understanding are men, researchers accept rather than question this. A focus on visible and audible conflicts, and on a tacit limitation of observations to the 'public' realm of irrigation (fields, and canals, meeting rooms and offices) may further hide gender (and women) from the view of irrigation researchers, at least in situations where women's struggles occur in less open and visible ways and where women are not routinely among those present in recognized public irrigation spaces.

recognizing the social positioning of irrigation actors in social relations of power, including gender relations. Rather than seeing actors solely in relation to the resource or activity of interest to the knower, Long suggests to perceive them as complex individuals, partly enrolled in the projects of others and partly involved in their own (Long, 1992). Giddens argues for the recognition that a person is positioned in *multiple* ways, with social relations conferred by *specific* social identities (Giddens, 1984:xxiv).

At a deeper level, the implication of embeddedness is that what the system *is* and how its boundaries are drawn is importantly constituted by the social, political and ecological context in which it is functioning. Indeed, the physical/technical and the social need to be analyzed simultaneously, as different but internally related dimensions of a single object (Mollinga, 1998). Also, and importantly, the boundaries of the system are not static, but change over time and are the subject of negotiation and struggle. In the words of Mollinga, "Time, space, and the properties of water are strategically used, contested and adapted by people when they conduct the activity of irrigation" (Mollinga, 1998:23). Describing and understanding an irrigation system requires what Haraway refers to as an *ontological choreography* (Haraway, 2003). It requires explicit inclusion of how different actors define and manipulate the boundaries and constituent elements of the system. As Bolding notes, in their lifetimes, irrigation systems tend to change and be transformed much more, and much more radically (through appropriation by users and frontline management staff and through changing intervention models and policy discourses) than many other technologies (Bolding, 2004).

Water management boundaries

Like 'the hardware' of irrigation systems, 'the software' – often understood as water users' associations - is also often modeled as relatively insulated from the social context. Individuals participating in these associations are expected to behave *as if* they are social equals. Not much thought is usually given to *who* are or should be the participants of water users' organizations. Instead, in most writings on participatory irrigation management, the group of farmers or irrigators is referred to as a group that is already existing and easily identifiable: those people that are served by a common irrigation facility. Participation is about participation of this group in the project or system of another group, the engineers or irrigation managers who are part of the state irrigation bureaucracy. Implicit in the theory that informs creation of WUAs, sharing the irrigation facility is what binds users together and what motivates them to collaborate and meet. Also in theory, for water users' organizations to effectively and successfully undertake the tasks they have been assigned, users are expected to 'set aside' their non-irrigating roles and identities. The ideal model of a water users' association thus presupposes the absence of social inequalities other than those ordained by the physical lay-out or division of the irrigation system, or by the division of irrigation related functions.

The ideal water users' association is to be an arena in which participants set aside such characteristics as differences in birth, wealth and gender and speak to another *as if* they are socially and economically equal.⁴⁴ The problem to be solved to make water users' organizations successful is the problem of 'insulating' irrigation management decision making processes from what are considered (in liberal terms) non-political or pre-political processes, those characteristic for instance of the economy (or the market), or the family (or the household) (cf. Fraser, 1997). The social context in which community organizations function is not entirely ignored, but seen in view of this problem. The ultimate concern is to unravel the determinants of 'well performing irrigation management institutions', while what good performance means is already decided - based on universal laws of human behavior and nature - and mostly expressed in rather narrow technical, productionist and economic terms. Really existing situations are thus described and judged on the basis of whether or to what extent they follow, or can be made to follow, the ideal model. The existing social relations of power and the existing culture and norms are loosely treated as the raw material from which institutions can be 'crafted', "the institutional resource bank from which arrangements can be drawn which reduce the social overhead costs of co-operation in resource management" (Clever, 2000:365).

Conceptually bounding the irrigation management domain to include all that irrigation experts consider as belonging to the irrigation system, to the exclusion of all else is not very conducive to making women and gender visible, let alone questioning it. To 'see' the social and gender in water management, a conceptualization is required that allows realization of the fact that water management is *embedded* (McCay and Jentoft, 1998), or that the boundaries between water management and its social and political environment are often permeable in both directions. First, what happens 'within' the formal water management domain is shaped and influenced by what happens 'outside' it. Second, events and decisions that have to do with water do not just take place within the formally defined water management domain. Illustrations of the first include the analysis of water management in the Philippines by Oorthuizen, who shows how intimate intra and interfamilial relationships between farmers, irrigation officials and politicians (either based on kinship or on *cumpadre/cummadre* ties) importantly shape (and in their turn are shaped by) water management activities and decisions (Oorthuizen, 2003). Van der Schaaf, in the study referred to earlier, tells the story of a widow whose irrigation water was repeatedly stolen. This widow was hesitant about bringing this up at the meeting of water users, since she suspected the thief to be the son of her

⁴⁴ This model of water users' organizations can be characterized as politically liberal in that it is founded on the autonomy of the political in a strong form. It is premised on the notion of abstract individualism and assumes that all people are equal in the public sphere, which is characterized by modern values of rationality and impartiality. See Fraser, 1997; Held, 1995; Luckham, Goetz and Kaldor, 2000 and Dietz, 1992.

husband's second wife. Her desire to keep peace in the family prevailed over her anxiety about her crop (Schaaf, van der, 2000:183).⁴⁵

That the insulation of the formal water management domain from its environment reflects experts' ideals rather than on-the-ground realities also shows in women's experiences as participants in users' organizations. Women do not stop being (seen as) women (to become gender-less rational deliberators) once they enter the formal public domain. One clear illustration of this is provided by an irrigation system in Peru, where about half of the members were women, and where both women and men attended meetings. Observations during these meetings showed that although male members on average talked around 28 minutes, female members only talked for 3.5 minutes. Although 'speaking time' cannot be used as a straightforward measure of influence (see Cleaver, 1999), women did explain that they felt diffident about articulating their concerns in meetings, and that they were afraid of making mistakes and being ridiculed (Krol, 1994). Another example is that of the Buttala irrigation system in Sri Lanka. Here, although 32% of the legal cultivators (who were entitled to membership in water users' organizations and participation in meetings) were women, only 21% of the actual members were female. Some of the women who were formally entitled to membership chose not to make use of this right. They preferred, instead, to have their husbands or sons register as members (Kome, 1997). In an irrigation system in México, only 15% of the female farmers thought that their opinions mattered in meetings, against 73% of the male farmers. Female farmers also displayed little interest in playing more active roles in the organization, since they felt that by doing so they would call into question their moral integrity and status as women (Ahlers, 2000). Reflecting on the reluctance of women to participate in meetings in an irrigation system in Nepal, van der Schaaf observed that if a woman would go to the meeting, this would signify the weakness and incompetence of her husband, and (to add insult to disgrace) it would imply admitting that she was smarter and cleverer than him (Schaaf, van der, 2000:186).

I could cite many more examples that suggest that gender 'infects' deliberation and decision making, even in the absence of formal entrance barriers. Public interaction and styles of deliberation are, almost everywhere, gendered in that there are distinct social norms and rules that define what sorts of interaction are permissible for women (and men), in what contexts, and using which modes of conduct. Fraser even goes further to suggest that discursive interactions within the public domain are governed by protocols and styles of decorum that are themselves correlates and markers of gender inequality (Fraser, 1997). In the above cited examples, to be outspoken and opinionated are positive characteristics for (some) men, markers of masculine 'distinction' in Pierre Bourdieu's sense; a way of defining and reconfirming masculinity and male superiority. Fraser's suggestion prompts

⁴⁵ Well documented illustrations of this are also provided in the studies by Narain, 2003; Mosse, 1997 and 1999; and Roth, 2003.

questions such as: How are styles of speech and behavior that are associated with men and masculinity evaluated, and how those associated with women and femininity? And to what extent are organizations such as water users' organizations itself a way of defining and reconfirming existing gendered norms and practices, and of distinguishing a separate male 'public' domain from a female 'domestic' or 'private' domain?

The second mentioned way in which water management is not strictly bounded is that water management is not confined to formal water management institutions. One of the more telling illustrations of this is the story many Andean irrigation professionals often tell when reflecting on gender: the fact that men participating in water management meetings always require a second meeting (the following day or week) to be able to make a decision. As the story goes, they want and need to first consult with their wives at home. There are some more, often rather anecdotal, examples of women playing important but non-formalized (and therefore non-recognized) roles in organizations or in carrying out collective action. Pradhan (1989) for instance describes how in the Bhanjyang Tar Ko Kulo in the hills of Nepal, women who were not formal members of the water users' association played key roles in solving a canal maintenance conflict between head- and tail-enders. In the Sreeramsagar project in India, women in one village organized among themselves to remove obstructions in the canal and guard the water flow. According to an old male farmer: "We have seen that nobody is bold enough to obstruct women and it made things easy for us" (Rao et al., 1991). While women may not be the formal or official irrigators, canal operators or office bearers of organizations, there exist quite some anecdotal examples of women helping their husbands with the work these jobs require, and sometimes even replacing them.

Indeed, water management can be seen to happen in a number of co-existing and partly overlapping 'domains of interaction' (Villareal, 1994), which are not limited to the ones recognized and designated for water management by policymakers and managers.⁴⁶ The very fact that formal water decision making is, or has come to be, seen and defined as something belonging to the sphere of men, may in itself prompt the emergence of alternative ways and networks for managing and dealing with water questions. Brunt for instance describes how, in an irrigation system in México, male farmers invited canal operators to bars and brothels as a strategy to strengthen and consolidate their access to water. Female farmers, for whom such behavior would be socially unacceptable, instead tried to invest in relations with male water leaders by giving them small presents, or by making them the god-fathers of their children (Brunt, 1992). In sum, 'seeing' gender in irrigation management thus not just requires allowing women to enter into the already defined and ideal-typical domains of irrigation decision making. It also and crucially requires *rethinking* the boundaries of, and functioning within, these domains. And it

46 Villareal defines domains of interaction as areas of social life wherein practices are routinely organized within specific locales and where certain authorities, values and identities are recognized, reproduced and transformed (Villareal, 1994:59).

includes a critical inquiry of how the drawing of boundaries between identified domains serves to maintain or erode existing constellations of gendered power and existing gendered identities.

Conclusions

In this chapter I have provided an account of how normal professionalism conceptualizes irrigation realities, and I have tried to show what such conceptualizations imply for 'seeing' women or for understanding gender. Irrigation science is a very particular form of science. It is no coincidence that in much irrigation science, the objects of inquiry are the very same objects that are manipulated through irrigation designs and policies. Indeed, it is appealing to understand irrigation discourses through the frame of analysis of Escobar, who argues for development thinking more in general that 'thinking' about objects (or bringing people into discourse) is not just an innocent act of making them visible, but is "mapping them into certain coordinates of control. The aim is not simply to discipline individuals, but to transform the conditions under which they live into a productive, normalized social environment: in short to create modernity" (Escobar, 1995:156). Although I do not adhere to as deterministic a view on the power of knowledge and discourses as Escobar, I do think that irrigation interventions and policy agendas and the conceptualization of what are considered significant irrigation problems are so intertwined from the start that the values and agendas important to irrigation policies also come to determine those of much irrigation research. Many irrigation texts have been funded by development cooperation money, and a large number of studies have arisen out of or were commissioned to inform specific irrigation programs. Helping make irrigation systems perform better has always been and continues to be a major objective of much research. This has an important effect on the standards of research competence that operate.

For one, familiarity with the international irrigation discourse often is of far greater importance than knowledge of a particular country for becoming an international expert. Many studies are produced for the international consumption of the agencies or universities that sponsored them, and are circulated only within a privileged circle of policymakers or academics. Another important implication relates to the substance of studies. Many are taken up with presenting quite basic information; studies are predominantly descriptive, providing evidence to substantiate a selection of key themes. Their thrust, in general, is to provide better irrigation designs or management models, rather than producing sharper analysis. Diverse irrigation realities across the world are reduced to 'key performance indicators' (see Perry, 1996; Molden et al., 1998) which can serve as the basis of comparison to compound "a screening process for selecting systems that perform relatively well, and those that do not" (Molden et al., 1998:19). Such systematic exclusion of context, or of the specifics of the cultural, social and political

environment, allows sustaining the façade of a universal and generic 'irrigation expertise' which can be applied the world over with only minor adjustments. It is an expertise that is intrinsically resilient to seeing gender, when it is accepted that gender is always necessarily about context. It is also an expertise that may not be hospitable to critical reflexivity, more in general, and by more constructivist approaches to knowing – since these risk unveiling and threatening the fundamentals of unequal economic and political relations on which such knowledge is founded and that it helps sustain.

I have tried to show how today's mainstream irrigation thinkers continue to share some of their main assumptions and perspectives with their colonial predecessors: most irrigation knowledge is produced to help planners, policymakers or irrigation system managers meet their goals; the irrigation system is seen and approached as a closed natural system; the 'machine' metaphor is implicit in much irrigation thinking; and increasing efficiencies or productivities (or the avoidance of 'waste', Gilmartin, 2003) continues to be a major rationale for justifying further efforts to modernize systems and make irrigation investments. Tracing such similarities is not meant to suggest that there has been no change or progress in irrigation science. The very fact that many contemporary irrigation professionals consider thinking about management a legitimate professional task is a change from colonial times when the need for a centralized and hierarchical management structure was taken for granted.

Yet, 'normal' irrigation knowledge often continues to be typically positivist, and much of it continues to be prescriptive: it is concerned with how irrigation realities *should* be, and possibly with why actual realities are different. It is less concerned with trying to understand the logic and determinants of such realities. Through prescriptive ways of 'ordering' realities as machines (irrigation systems, organizations, institutions, economies), people are also 'ordered' and 'normalized' – they exist in these conceptualizations and narratives as little robots that act on the basis of a clearly identifiable and known (to planners, managers, knowers) sets of incentives, incentives that can be manipulated or at least to some extent controlled by those (assumed to be) in power. Gender, just as other social differences and social relations of power, are 'assumed away'. They do not fit in the rational, logical and scientific organization of the irrigation world, either because they are seen as despicable remnants of backward cultures or traditions, or because they are seen to belong to the non-irrigation world of the family and the private that should and therefore do not matter for (understanding) what goes on in the irrigation world.

Seeing women, and providing them with a legitimate discursive existence in mainstream conceptualizations of irrigation, is possible in two distinct ways which are not mutually exclusive. The first consists of the argument that among the irrigators, the inhabitants of the world of reason and work, there are also women. This is the argument that women are similar to all other irrigators, and its effectiveness importantly rests on convincingly showing that women, too, are endowed with the gifts of reason and rationality, that they too can irrigate and farm,

etc. – in other words, that they are humans, too. It rests, in short, on proving that women are like men – and thus on questioning the ideological and symbolic association of productive work and the public domain with masculinity and domestic work and the private domain with femininity. Showing that women are irrigators, too, is a potentially effective strategy to claim rights to water and land for them, as well. Yet, it is not very effective in thematizing and questioning gender inequities as they relate to irrigation, since thus mainstreaming gender results in the (discursive) transformation of women into irrigators and water managers, a process during which they (by definition) leave aside their non-irrigation identities and thus cease to exist as women. Thus mainstreaming gender, therefore, automatically implies its disappearance as a theme that can be discussed or talked about. Women, just like men, are treated as ‘universal’ subjects (who are implicitly modelled on men), and ‘the gender question’ is reduced to one of exclusion or lack of integration.

The second way to show that women ‘matter’ is to discursively create them as a distinct functional group in relation to the irrigation system. This is the argument that they are different. This can for instance be done by showing that women’s water needs are distinct from those of men. Or it can be done by showing that female farmers systematically have different assessments of the irrigation system’s outputs, impacts and internal operations as compared to male farmers. It entails, in other words, the establishment of another important category of individuals next to the already existing category of irrigators, and claiming some degree of acceptance and ‘normalcy’ for this group as well. It may also entail a change in the ideas about what the irrigation system ‘produces’ or should produce, for instance by including water for domestic uses. And it may entail shifting the system’s boundaries, for instance by including women’s homestead gardens in the area that is to be served by the system. It implies, in other words, the expansion of the irrigation reality with a distinct ‘women’s domain’, and the granting of irrigator status to women on the basis of their gender.

This second way of making women visible clearly does put them on the irrigation map, and allows thinking about their specific water needs and demands. Yet, it is not without problems. Women are made visible *as women*, as individuals whose identities and needs are derived from the fact that they belong to the female gender. Their link to the irrigation system, and thus their existence in irrigation discourse, is also seen as primarily determined by their gender. What is tricky about this is that women’s irrigation existence depends on their gender, while that of men is simply there and unrelated to their social identity. Masculinity is thus assumed and taken as the norm while femininity gets to be defined as the difference, that what needs mentioning. It limits the definition of the female subject to gender identity, completely bypassing other identities. Women are seen as a social category, whose irrigation needs or activities are (just or primarily) determined by their gender. Such reductionism discursively constructs women in implicit opposition to the construction of irrigators, who are (assumed to be) men. Women’s professional identities as farmers and irrigators become difficult to see and understand, while

men's identities as irrigators are over-emphasized to the neglect of their other identities. The two categories are defined as mutually exclusionary, and dichotomous.

The two ways of making women visible in mainstream irrigation thinking imply a conceptualization of gender as an attribute of a social category. This attribute is either irrelevant to irrigation because rational irrigation behavior is not influenced by the gender category to which one belongs (but conceptually 'bracketed away' and defined by one's function and location in the irrigation system), or it becomes itself a determinant of irrigation behavior (dividing the irrigation world in 'normal' irrigators and women). Yet, as Jackson states, "women are not simply excluded subjects, equivalent to anatomically challenged poor men" (Jackson, 1998b:25), as the first way of treating gender as an attribute implies. The simple dichotomous conceptualization of gender as two separate social categories of human beings that belongs to the second way of dealing with gender as an attribute is also analytically problematic. It leads to the universalization and essentialization of gender differences, and thus risks 'freezing' them rather than questioning and challenging them. It is based on the existence of an already existing female identity, of the construction of women as an already constituted, coherent group with identical irrigation interests and desires, regardless of class, ethnic or racial location, or contradictions. This group of women exists prior to the process of analysis, and prior to their entry into the arena of social relations or the irrigation system (cf. Mohanty, 1991). As was explained in the first chapter, questioning gender requires a social relational approach in which men and women are seen as parties to sets of social relations (involving rights, resources, responsibilities and meanings) with other men and women through which what it means to be a woman (and a man), in that time and social place, is defined and experienced. Gender operates within social categories rather than through pre-existing bounded groups of men and women. Categories of men and women are to be deconstructed, allowing differences within gender divisions, recognizing male gender interests and identities, and separating actually existing women and men from (hegemonic) femininity and masculinity (Connell, 1995).

A plot of one's own? Gender and irrigation in Burkina Faso.

Women's fields are made at night (Mossi proverb, cited in: Doris Bonnet, 1982).

In many cases, we shall feel doubt about whether physical improvements will really produce yield improvements. The source of the doubt is the behavior of the farmers. I feel that we need to give increased attention to studies of the farmers' motivation, and to understanding their total economic situation. (...) The importance of developing this sort of understanding is that (without it) we are in danger of making recommendations in such areas as physical rehabilitation, and subsequently finding that these changes produce no output benefits because the farmers' needs are not what we anticipated (C. Abernethy, 1993)

In this chapter, I contrast the findings of a case study done in Burkina Faso with professional discussions about irrigation in Africa on the one hand, and 'feminist' discussions on how to make sense of African gender relations in farming on the other. My aim with this exercise is first of all to identify the 'gaps' between what I have labeled (in the first chapter) as the first and the second irrigation worlds: the world of the irrigation system and its inhabitants and the world of thinking about irrigation, respectively. I use 'feminist' reflections about gendered farming realities in Africa to try making sense of these gaps. The final aim of the chapter is to further reflect on how the discursive spaces within irrigation thinking to articulate and discuss questions of gender can be opened up, and on how possibilities to allow female protagonism in irrigation can be improved.

The case study is based on field work¹ that was done during the 1994 rainy season in Burkina Faso. The study was part of a larger research initiative conducted by IIMI at that time, aimed at understanding and improving the performance of small irrigation systems in Burkina Faso. The study also was among the first gender studies done to explore the linkages between gender relations and irrigation at IIMI,

1 Clarisse Zoungrana was the main researcher for this study. Results of the study have been published as a conference paper for the 16th International Congress on Irrigation and Drainage, and as research papers in the CGIAR Gender Publications Series and the IIMI Research Papers series - all in 1996. See Zwarteveen, 1996.

and one of its implicit objectives was to establish the need for gender studies in the context of IIMI. Citing from my own research proposal, written in 1993, "It is clear that the gender based organization of agricultural production, and especially the intra-household allocation of resources and incomes, will determine the actual and potential performance of the agricultural production system as a whole, and of the irrigation system in particular. The most important implication is that costs of labor (and possibly other resources), as well as incentives for intensifying production are not solely determined by the market, but also by intra-household gender relations (obligations and responsibilities). Important, too, are inter-household responsibilities, such as the responsibility of women to assist their parents, or the responsibility of brothers to assist their single adult sisters, etc. More specifically, when trying to understand economic and agricultural performances of irrigation systems, it is necessary to distinguish between plots (i.e. their designation (family or individual), who controls them), between female labor and male labor, between the share of each productive activity that is individually controlled and the share that is used for feeding the family, and to explore the linkages between these." (Zwarteveen, 1993b). In short, I tried justifying spending time and effort on a gender study by claiming its importance for understanding the performance of irrigation systems, the accepted objective of IIMI research.

The particular way I hoped to achieve this in this study was by investigating the implications of individual allocation of irrigated plots in terms of intra-household labor allocation, agricultural productivity and intra-household gender relations. The hypothesis that guided the study was that it would make more sense, both in terms of productivity as well as in terms of gender equity, to provide irrigated plots to both men and women instead of allocating such plots to only men or to only women. Research was conducted in the Dakiri irrigation system in Burkina Faso. Dakiri is one of the few systems in Burkina Faso where some women obtained access to irrigated plots. Sixty women (or 9% of the total number of plottolders) had their own individual plots. Most of their husbands also had plots. The study consisted of detailed semi-structured interviews with male and female members of twenty households. In ten of these households only men had access to plots, while in the other ten women also had plots. The interviews focused on unraveling intra-household patterns of labor allocation and income distribution. In addition, yield information gathered in the context of IIMI-Burkina Faso studies was analyzed in order to establish the production effects of the gender of the plottolder.

The results of the 1994 case study provide an interesting challenge to thinking about and conceptualizing irrigation realities, which is why I have chosen to reproduce them here and to use them to further reflect on my main question: how can irrigation realities be conceptualized in ways that enable recognition of gender as constitutive? I start the chapter with an introduction to professional 'irrigation in Africa' discussions, because this is how the study was first done and written: from within a professional context that was more concerned about irrigation performance than about gender. The rest of the chapter is used to present the findings of the

Dakiri case study. I first explain the organization of farming in Dakiri, which is a complex set-up of differently designated fields on which different crops are grown, marking patterns of intra-household rights and responsibilities that are clearly gendered. I continue with an exploration, based on the findings of the case-study, of how the introduction of new irrigation possibilities has altered existing ways of organizing labor and the division of produce and incomes. Central to this exploration is the aforementioned question about whether it makes a difference to whom irrigated plots are allocated. The analysis shows that there is more than just the gender of the plotholder that matters in determining how plots are used, and how incomes from plots are divided. The picture that emerges is one of complex interdependencies between household members who belong to larger family and lineage groupings, with both women and men precariously balancing personal with collective needs and interests.

I use the concluding section of this chapter to contrast these findings to wider discussions about feminism and agriculture in Africa. Central to the chapter is the difficulty both irrigation professionals as well as feminists have in making sense of African women farmers, since neither the nuclear household nor the autonomous (and liberated) rational individual provide very illuminating entry-points for understanding the behavior of African women farmers, or for qualifying gender relations in farming. I suggest that an approach that focuses on the understanding of social relations in shaping livelihoods lies at the basis of a way of thinking about irrigation that allows recognition of both the collaboration as well as the conflicts between the genders in farming.

Irrigation in West Africa

Central to thinking about irrigation in Africa is the question whether productive irrigation development is compatible with existing (traditional) ways of farming and organizing life. In what follows in this section, I first present the idea that there is a typical 'African' way of farming and irrigating that is distinctly different from how western or western-trained 'engineers' conceive of modern agricultural production. I continue by showing how this idea has pervaded discussions about irrigation development, and by how it has also influenced thinking about women and gender. Central in the discussions is the question whether to cherish and build on existing farming traditions, customs and knowledge, or whether – instead – these need to be removed and replaced by institutions that are more compatible with modernity and development. In parallel, feminist discussions center around the question of how to make sense of the centrality of female labor in African farming: is this a sign of women's exploitation, or does it instead reflect their independence and power? These debates form the background against which I discuss the case study findings in order to reflect on the wider theme of the book.

'Engineering' and 'African' irrigation paradigms

Especially after the Sahelian drought in the 1970s, irrigation development in West Africa came to be viewed in development circles as 'a privileged solution' (Moris, 1987) to achieving the twin goals of national food self sufficiency and food security. Government policies and development efforts, supported by the international donor community, resulted in rapid expansion of irrigated area in the region.² The success of these irrigation development efforts was disappointing; in spite of huge investments, productivity remained far below expectations and national food imports continued to increase. Food production targets were not met, development costs were extremely high in relation to returns and there were many technical and managerial problems. The decrease in real terms of world cereal prices made it even more difficult to invest in and maintain irrigated agriculture for basic grain crops. One recurrent explanation for the lack of success was that foreign or western irrigation designs and technologies were not appropriate for Africa, both in terms of agricultural logic as in terms of organization and management. Diemer elaborated and substantiated this hypothesis. He showed that the engineering knowledge that provided the basis of most early irrigation development efforts came from engineering consultants who had acquired their expertise in colonial Asia or in centrally run plantations. Largely, the design of African schemes followed the same principles as the schemes that were designed and built in Asia. Organizationally, the schemes were also very similar, roughly following the flow of the water through the canal network. Schemes were to be managed and operated by technically trained staffs, who often were foreigners. In this set-up, farmers were like plantation workers who were expected to obey the regulations and follow the prescriptions laid out by the scheme management. Planting dates, cropping patterns, water distribution schedules and much else were centrally determined, and often input distribution and marketing were also arranged by staff of the scheme rather than by farmers. Farmers' wishes or customs were ignored, all decisions about the design of the physical, economical and organizational infrastructure were agreed upon between donors and African ministries, on the basis of reports provided by engineering firms (see Diemer, 1990).

Analyses similar to Diemer's have fuelled irrigation discussions about Africa in the 1980s and 1990s. Many agreed that large centrally run irrigation schemes were ill suited for Africa. Meant to act as engines of progress and triggers of modernity, large irrigation schemes came to be singled out as the focus of criticisms from many directions. They were seen as perpetuating underdevelopment, creating social and economic dependencies at different levels, increasing social differentiation and damaging the natural environment. In addition, large irrigation development initiatives were seen as a drain on the scarce resources of African economies. Low performance levels in terms of low cropping intensities and yields, low irrigation efficiencies and low levels of cost recovery were attributed to a combination of poor

2 Also see Manzungu, 1999 and Chidenga, 2003 for reviews of irrigation discussions in Africa.

infrastructure, expensive and faulty designs, poor drainage and land leveling, and poor operation and maintenance (See Adams, 1992; Barnett, 1977, 1979; Kortenhorst *et al.*, 1989, Moris and Thom, 1990, Underhill, 1990). A large burden of blame went to the centralized, authoritarian government bureaucracies managing and operating the large irrigation schemes. Rather than being accountable to farmers, these irrigation providers were accountable to financiers, and no feed-back mechanisms existed to adjust design and management decisions to realities 'in the field'.

Who controls, whose knowledge, who pays?

One response to the failure of large schemes was the development of smaller scale irrigation technologies that were more appropriate to local customs and practices. Another, parallel, response was the decentralization of control. In the engineering paradigm, centralizing control had been a rational response to risk. The disappointing performance of most African schemes, however, led to seriously questioning the need for a centrally positioned controlling authority in which all powers and information were concentrated. Some even argued that the quest for centralized control was counterproductive. Rather than controlling and thereby stifling the skills and innovativeness of farmers, these had to be harnessed (Moris and Thom, 1987). Irrigation policies should be directed toward the adoption of new, flexible, and innovative approaches to water management practices, designing irrigation initiatives that build upon and support existing, informal, farmer-controlled schemes (Moris, 1990; FAO, 2001). Control and authority over irrigation had to be decentralized, and farmers were to be made responsible for scheme management and operation.

Combining the two responses, a new popular irrigation scenario favored development of small schemes primed on existing practices and modalities contained in the African irrigation paradigm (Adams, 1990; Diemer, 1990). Much effort went into studying and 'translating' the secret of farmer managed irrigation schemes into methodologies for farmer design and management of new irrigated schemes (DISC, 1990; IIMI, 1987; Ubels and Horst, 1993). 'Adapting' the new schemes as much as possible to existing customs and practices thus became the major challenge, a challenge which could largely be met by leaving enough space (in terms of technical design, in terms of time and in terms of organization) for farmers to adopt the newly introduced techniques into their own farming and political worlds, and to attribute their own meanings and values to them. New irrigation systems had to slowly become embedded in existing ways of living and organizing, and in the process, these systems would be adapted to the wishes and demands of farmers.

In more recent years, calls for more farmer control and participation have gone accompanied with calls for market reforms. On the waves of neo-liberalism in the 1990s, the new policy mantra advocated drastic reforms of irrigation management organizations along the lines of 'more market, more users, less state, better

technology'.³ Donor investments in irrigation seriously declined, while the Washington consensus forced national governments to drastically reduce public irrigation spending. A retrenchment of irrigation agency staff was the result, and decentralization thus became as much a cost saving measure as it was a means to better adapt technologies and management structures to local realities. Today's irrigation-in-Africa discussions continue to be characterized by the question whether public investments in irrigation (construction or rehabilitation, or management reform) are worth their while. There are serious doubts about the applicability for Africa of irrigation management transfer models implemented elsewhere in the world, as a means to make farmers not just organizationally and technically but also financially responsible for system operation and maintenance (Shah et al., 2002; IWMI South Africa, 2002). It is argued that to make it possible for farmers to pay for relatively expensive irrigation fees, productivity of smallholder schemes should dramatically increase, as should farmers' incomes (Shah et al., 2002).

Besides a number of technical and managerial problems, two issues are identified as posing a barrier to further increases in productivity. The first is related to the co-existence of traditional systems of land tenure with so-called modern systems, each of which are "supported by their own logic, but in many respects they conflict with each other" (Abernethy, 1994:29). The resulting tenure insecurity "limits farmer incentives to make long term development investments on their land. Moreover, the present arrangement does not provide room and incentive for uninterested farmers to sell out, and to interested and capable ones to expand their holdings" (Shah et al., 2002). The second is the interaction of irrigated agriculture with rain-fed farming and livestock. Such interaction was (and continues to be) one of the distinctive features of farmer managed irrigation schemes in much of Africa, as for instance identified by Diemer (1990). Where the engineering paradigm was based on the assumption of mono-cropping, and consequently estimated optimal productivity and performance levels assuming that all available labor and other farm inputs were mobilized and used for producing irrigated crops, in many African systems farm households strategically invested the labor and land resources in different productive enterprises so as to minimize risks and optimize returns to labor, and ensure staple food production. According to some analysts, this strategy of depending on a variety of sources to earn a livelihood stands in the way of realizing the full productive potential of irrigated plots and of irrigation schemes. A central premise underlying these two concerns appears to be that traditions -- land-tenure and farming systems -- form an obstacle to irrigation development and to the associated increases in the productivity of irrigated land.

With this premise, thinking about irrigation seems to have moved almost full circle with respect to its view on existing customs, tenure systems, farming practices and organizational and political structures. Where the large schemes designed and

3 Arne Musch provides a detailed description of the process of decentralization and increasing farmer participation for the Office du Niger in Mali, and for the Betsiboka system in Madagascar (Musch, 2001). Also see Abernethy et al., 2000 and Wester et al., 1995.

constructed in the 1960s and 1970s explicitly aimed at the eradication of 'backward' traditions, much irrigation thinking throughout the 1980s and part of the 1990s was aimed at the *recognition* of such traditions and claimed that irrigation designs needed to be, as much as possible, adapted to local agricultural practices, rules and organizations. Recent irrigation documents again express serious doubts about the wisdom of such cherishing of local customs, and identify existing tenure systems and livelihood strategies as barriers to achieving high irrigation productivities. Thinking about how farmers can best be turned into the risk-taking entrepreneurs that modern economies demand has changed, however. Rather than through government subsidized and managed large or smaller irrigation schemes, much hope is now vested in creating enabling conditions for the private sector to blossom and in creating better linkages to markets for value-added products. Rather than irrigation systems that require collaboration between many small farmers (and thus demand management control and entail high overhead costs), smaller and cheaper technologies such as the treadle pump that can be individually owned and controlled are now widely promoted.⁴

Recognizing women in irrigation

And what about gender? Gender and irrigation studies conducted in the 1980s and early 1990s (such as those described in chapter 2) joined in the more general concert of critique aimed at large scale irrigation interventions. Most studies pointed at the importance of understanding gender relations for achieving irrigation successes, and many combined pleas for understanding women as farmers in their own right with calls for more attention to existing livelihood strategies and intra-household patterns of rights and responsibilities when planning and designing irrigation schemes. The effect of such pleas for attention to gender was that new irrigation projects often included specific women or gender components, mostly in the form of small sub-projects such as gardens for women. While small in size and negligible in terms of the proportion of funds that went into these components, in some instances the fact that women were seen, heard and talked about created space for women themselves to actively demand for a greater share of the project's benefits (see for examples Povel, 1990; Helsloot, 1990).

As also explained in chapter 2, what the early studies revealed was that men only had very partial control over the labor of women. Mobilization of women's labor for irrigated production could thus not be guaranteed through men. Based on this insight, some preached the reversal of 'normal' plot allocation policies and advocated allocation of plots to women only, or at least the prioritization of women in plot allocation, a recommendation that was hardly ever followed.⁵ In one well

4 This shift from technological optimism to market optimism parallels a reduction in the number of irrigation engineers in favor of economists in dictating the terms of the irrigation debate.

5 According to a World Bank review report: "For example, after 50 years only 12 of the 2,348 farmers under the Office du Niger in Mali were women; all land titles granted by the Volta Valley

documented case where it was adopted (see Carney, 1988 and 1998; Kooyman, 1990), it led to a re-definition of plots in women's names as collective family plots, thus reducing female control over the produced crops without reducing their labor obligations. In all, and as Diemer and Vincent concluded in their review of irrigation policy documents in 1992: "While technical assistance groups do express support for initiatives to support income generation for women, there seems to be continuing unease at debating the issue of shifting economic and political power between men and women, or of actually developing interventions which preserve women's rights in tenure and decision making" (Diemer and Vincent, 1992:137).

The participatory irrigation intervention mode that was popular in the 1990s contained few explicit thoughts about gender relations. Its recipe of 'adapting' new irrigation systems to existing agricultural practices and political customs in practice often meant that important allocation and management choices were left to be decided by farmer organizations through participatory design and management processes. By and large, this meant the acceptance of existing social relations, practices and customs, and the channeling of most decision making processes through existing networks that often turned out to be male-dominated. This is why these efforts seldom provided a strong guarantee that women's interests were represented. While gender had never received much explicit discussion in irrigation writings, the celebration of 'local norms and practices' and the norm of non-interference the new intervention mode entailed did not help to increase its visibility. The implicit bottom-line was that western feminist concerns were not to be pushed onto African communities. The absence of explicit discussion about gender in policy documents, however, did not always imply the complete neglect of gender in projects. Some of the projects that took their task in recognizing existing social relations and agricultural practices seriously showed remarkable creativity in making gender concerns central to the topics that needed debate and discussion among project beneficiaries. Some interesting, but often very poorly documented, results were achieved in terms of sharing voice and benefits between the genders.⁶

Authority in Burkina Faso went to male household heads; and women 'own' only 4% of the village perimeter area and 2.7% of the cuvette area in Podor department in Senegal. Women's access to irrigated land in the Bakel small irrigated perimeters of Senegal is related to the availability of this land. Nearly 20% of households in the fleuve area of Mauritania are headed by women, and yet women comprise only about 5% of participants in SONADER schemes, 1% on AGETA and 7% on Ferme M'Pourie. Even when an effort is made to retain women as the users of the land, the advantage may still go to men in the long term, as was the case in Operation Riz in Burkina Faso, or may be frustrated by male authorities. A 1984 NGO proposal to allocate plots equally to men and women on the Niandane III perimeter in Senegal "was opposed by the local rural council in favor of allocation to heads of households" (World Bank, 1995:35)

6 Much of this experience lies hidden in the archives of organizations involved in irrigation. Systematically documenting and analyzing these documents in view of the various efforts that were undertaken in the 1990s in irrigation projects in Senegal, Burkina Faso and Mali (and maybe other countries) to address gender concerns would be an interesting and worthwhile research project, that would generate important 'lessons' about gender relations and irrigation in Africa.

Today's irrigation policies, with their strong neo-liberal flavor, continue to remain largely implicit about gender relations. In their recognition that many African farmers are women, however, the views about gender relations that are promoted have radically changed from those of the last decades of the previous century. Rather than reserving women for the housewife-cum-mother role, women are now often portrayed and celebrated as farmers in their own right. Current consensus is that women farmers, maybe even more than men (many of whom migrate to cities anyway) require active support in terms of education, security of tenure, access to credit and agricultural services. Many international donor organizations agree that African women farmers must now be targeted as the principal clients of agricultural development projects (World Bank, 1995), and in many documents promoting small-scale irrigation technologies such as treadle pumps women figure prominently (at least in the pictures that accompany the texts) as major beneficiaries. Indeed, the now recognized centrality of women's labor to farming has led to portraying African women farmers in irrigation policy documents as the archetype of the liberal emancipated woman: an assertive individual who is not socially or economically dependent on others and whose behaviors and decisions are based on rational choices.

Representing gendered farming realities

Whether or not this image of African farmers as rational entrepreneurs is accurate or politically desirable also is and has been central to feminist discussions about how to best represent, recognize and make sense of gender relations and women's experiences in African farming, and about what kinds of changes are desirable for women. As described in chapter 2, many of these discussions were rooted in Ester Boserup's analysis that drew the attention to the centrality of women in African farming systems (Boserup, 1970). Both in terms of labor force participation and time input, Boserup argued, women make a greater contribution to African agriculture than men, hence the use of the term 'female farming'. Boserup's theories have been criticized for taking a fixed, evolutionary perspective based on a western 'modernization' model (Benería and Sen, 1981). Guyer also rejected Boserup's association made between female farming and 'primitive' agriculture in an evolutionary sense. Countering this model of 'naturalism', she argued that cultivation of Africa's oldest staples (yams, millet and sorghum) did not rely on female labor alone. Rather, ritualized divisions of labor with a sequential mix of male and female tasks were the norm. Thus 'female farming' did not precede male farming, nor were gendered patterns of agricultural production determined by the inherent characteristics of the crops in question or by women's childbearing and child rearing responsibilities that shape their labor inputs (Guyer, 1984). Whitehead (1991) showed that so-called female farming systems were actually based on a complex interrelationship of male and female labor, while Wright (1983) arrived at a similar conclusion when questioning the opposition Boserup had posited between

male plough and female hoe farming systems. She argued that it is true that in some areas men have turned to ploughs, but that this has not replaced women's hoe cultivation. In all, and as Bryceson concludes in a review of work on African hoe cultivators: "These and other critiques of Boserup's portrayal of African female farming systems and evolutionary tendencies offer important challenges to the theory, but they have not dislodged the fundamental premise that female labor is central to African agriculture." (Bryceson, 1995:7)

The question of how to conceptualize and interpret this centrality remains the topic of debate. Many have joined Boserup in depicting hoe agriculture as a trait of backwardness and underdevelopment, and as a sign that women are exploited by traditional patriarchal systems, colonialism or a combination of both. Others, in contrast, have used the image of strong African women farmers as reflecting their economic and social autonomy, an autonomy that is and was threatened by capitalist development and western technologies. Are African women farmers strong and autonomous, or are they vulnerable and dependent? Afonja has charged Western researchers of not being able to reconcile women's low status in the domestic domain with their high visibility and participation in the public domain of work (Afonja, 1981). Guyer recounted an interchange witnessed at a session of the African Studies Association meeting: "to a perfectly reasoned comparative and typological discussion of Yoruba women's economic freedom, a female Yoruba participant responded with profound exasperation: "We are *not liberated!*" (Guyer, 1995:29). Vijfhuizen notes how African women farmers are often depicted as victims of social structures. Such representation did not correspond to her own observations from Zimbabwe: she saw women as active and knowledgeable actors who actively shaped their own lives and struggled for power and resources (Vijfhuizen, 1998). And Ekejiuba recounts how one of the main problems she had as a graduate student of anthropology at Harvard in the 1970s was reconciling her Nigerian childhood experiences of women as initiators of development and active participants of social and economic processes in their communities with their image in much of the literature at that time as 'marginalized', 'downtrodden', and 'exploited' by patriarchy and motherhood (Ekejiuba, 1995:48).

Similar and related confusions and disagreements exist about how gender relations evolved historically, and about whether women were better or worse off in a pre-colonial past. Most scholars now agree that the varied and contradictory variations that occurred in the degree and forms of (female) farming cannot be explained by referring to simple models of evolutionary change, straightforward transformations in culturally defined divisions of labor or unambiguous linear trends (rise or fall) in female status. As Guyer writes: "untested assumptions shortcut the understanding of both men's and women's, separate and joint, construction of plausible ways of living in the present and of envisaging possible futures, using the experiential and cultural legacies of the past (...). So we are only part way towards rethinking the powerful propositions of evolutionary and structural theory in the light of twentieth-century dynamics. Until new syntheses

may be worked out, the logic of inquiry has to be multiple, experimental and ultimately participatory" (Guyer, 1995: 44).

The Dakiri irrigation system

In this section, I describe the Dakiri irrigation system, focusing on the intra-household organization of agricultural production. Dakiri is one of the 64 small irrigation systems backed by storage dams in Burkina Faso⁷. Construction of these reservoirs was mainly motivated by a need to shield rural populations against climatic variability by providing them with a relatively secure source of water for domestic use, livestock and modest home gardens. Efforts to develop irrigated agriculture around these small dams took off in the 1960s, spearheaded by the government with the support of international donor agencies and non-governmental organizations. The area of land developed for irrigation in the 64 reservoir systems is about 2,497 hectares in all. On average, about 86% of the developed land is utilized. Individual landholdings are relatively small, ranging from 0.08 to 0.25 hectare. Crop yields are moderate, and in those systems where rice is the main wet season crop (about 70-80% of all systems) the seasonal mean yield obtained is about 4.4 tons per hectare.

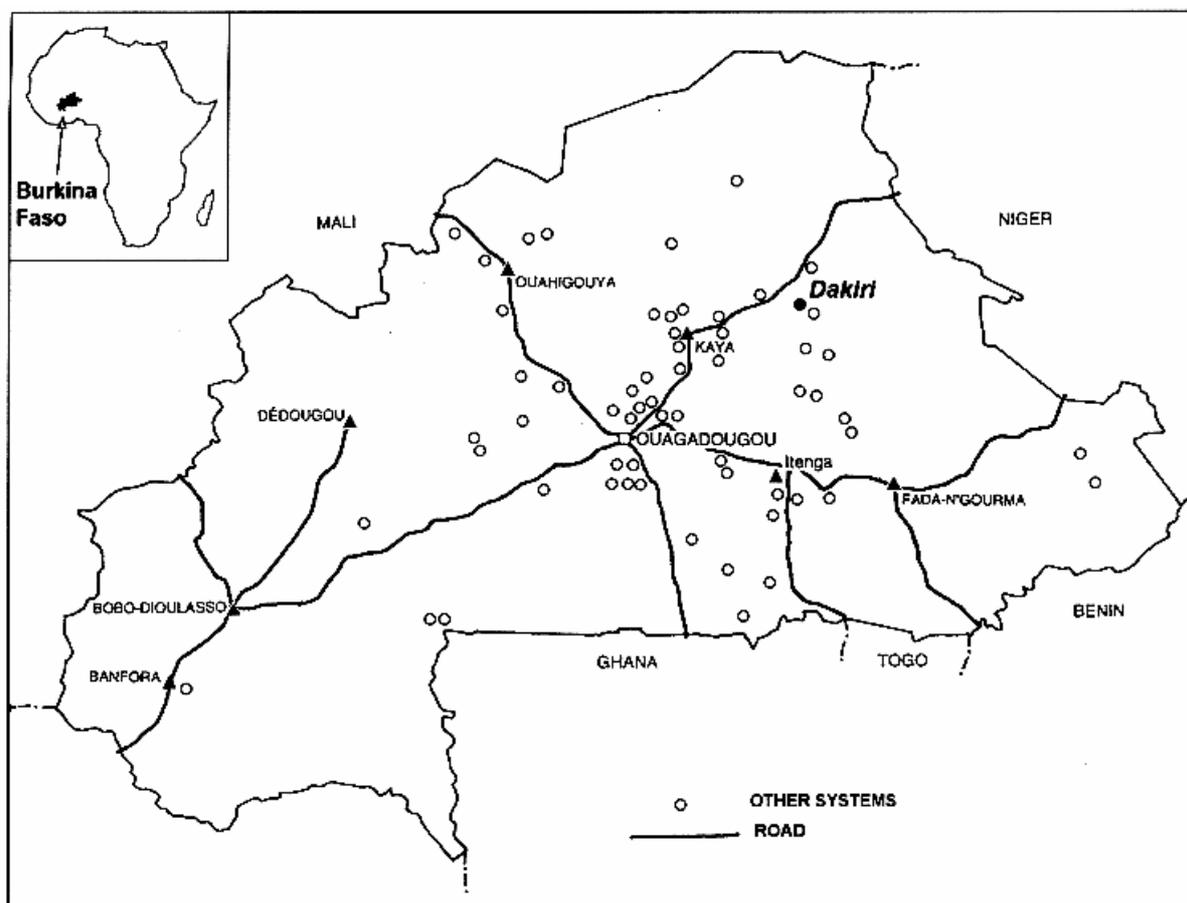
The Dakiri irrigation system has a command area of 120 ha, of which 112 ha are being cultivated by 740 farmers. Individual plot sizes are either 0.08 or 0.16 ha. The Dakiri reservoir has a capacity of 10,460,000 m³. The first year of irrigation in Dakiri (in its present form) was in 1984. Most of the command area is cultivated with rice twice a year, and the cropping intensity is 200%. Total annual production is almost 900 tons, and agricultural productivity is about 4.7 t/ha, which compares favorably with figures for the rest of Burkina Faso. Table 4.2 presents the main features of the Dakiri irrigation system, while the map of figure 4.1 shows the location of the scheme.

Table 4.1. Main features of the Dakiri irrigation system

Distance from Ouagadougou (km)	250 km NE	Size of landholding (ha)	0.08-0.16
Dam construction date	1959	Type of irrigation	gravity
Rehabilitation date	1984	Main canal capacity (l/s)	670
Catchment area (km ²)	2,300	No. of secondary canals	13
Reservoir volume (m ³)	10,460,000	Wet season crop	rice
Command area (ha)	112	Dry season crop	rice
Res Vol/Com area (m ³ /ha)	93,390	Cropping intensity	200%
No. of plottolders	740	Type of organization	Cooperative

Source: Sally and Abernethy, 1993:4

⁷ Data presented here come from Sally, 1993 and Abernethy, 1994.

Figure 4.1. Location of the Dakiri irrigation system

Source: Sally and Abernethy, 1993

In what follows in this section, I describe the basic features of the intra-household organization of farming in Dakiri before (or without) irrigation. I show the different arrangements that exist within and between households to optimize the chances of everybody's survival. Describing and conceptualizing households and intra-household allocational practices are at the heart of feminist thinking, and anthropological evidence from Africa about the existence of less corporate forms of householding than those assumed in 'normal' economic thinking has been very influential in fuelling these debates (cf. Kandiyoti, 1998). I do not reiterate or engage with these debates here, but use their general insight that "households are loci of competing interests, rights, obligations and resources, where household members are often involved in bargaining, negotiations and possibly even conflict" (Moore, 1994:87) to offer a general account of how households function in Dakiri. In the section after this one, I analyze how the introduction of irrigation has influenced the prevailing way of organizing farming.

Traditional family or household structure

Most of the plottolders in Dakiri belong to the ethnic group of the Gulmacé (about 80%), while the rest are Mossi. In the traditional family structure of the Gulmacé in Burkina Faso, members of an extended family (consisting of several generations of men (brothers, sons) with their wives and children) lived together in a large homestead, at the head of which stood the eldest male member, who was called the *dedano*. At the time of the study, in Dakiri the large extended family had virtually disappeared. Households most often consisted of a husband, his wife or wives and their children. Sometimes (one of) the parents of the husband lived with the family. In polygamous households, women with their own children often formed semi-separate 'units' ('kitchen units' or 'hearth-holds', see Ekejiuba, 1995), implying that they separately pounded their millet and were, to a certain degree, responsible for feeding their own children. In the studied area, co-wives in polygamous households usually took turns in preparing meals: the day a woman was responsible for cooking was called 'the kitchen day' and this was also the day she had less time to work in the fields.

In the area, marriages are patrilocal; women leave their parental homes to live with the family of their husbands upon marriage. Upon marriage, the parental family of the groom has to pay a bride wealth to the parents of the bride. Also, young men wanting to marry a woman have to work for several (2 to 6) years on the fields of their future parents-in-law. Both gestures are seen as compensation for the loss of labor the wedding of a daughter entails, and they underscore the critical importance of labor as a production factor in rural household's livelihood strategies. Although they move away, married women do often maintain good relations with their parents and with their brothers from the same mother, for instance through regular gifts in the form of money or a share of their harvest.

Fields

Each (extended) family has a number of fields at their disposal of different quality. The allocation of these lands to different purposes and to different family members is the exclusive right of the head of the homestead, and at the village level of the *chef de terre*. Land tenure is framed in mystic or religious terms: ancestors or spirits watch over the 'well-being' of land and punish transgressions. The ancestors entrust an intermediary, the earth priest or *chef de terre*, with authority to resolve land tenure issues. This authority is derived from the 'first' people to occupy the land: his ancestors are buried there and were the first to approach local spirits.⁸ An individual cannot, therefore, claim to have rights to land independently of those rights granted to him by the ancestors or spirits, via the *chef de terre* (Kevane and Gray, 1999:7). Historically, land was thus not held by individuals, but controlled by corporate groups. The primary way cultivators gained rights was from membership in such

8 See also van Koppen, 1998a; Kevane and Gray, 1999

groups (Kevane and Gray, 1999; van Koppen, 1998a). Most local rules do not attribute women with direct standing as holders of rights to land. Few women assume the authority of *chef de terre*⁹, nor are women normally allowed to have permanent rights to use land. Widows who may assume the responsibility for the land of a deceased husband form an exception to this rule.

The different types of land that are distinguished are: homegardens (*champs de case*), lowland swamps (*champs bas fonds*), collective lands and individual plots. While the distinction between the different fields partly refers to a difference in soil quality and crops grown, it also marks a pattern of labor and property rights, whereby some fields are categorized for collective household subsistence needs and others for production for individual use or exchange. *Homegarden plots* are the plots that are generally located nearby the homesteads. These fields are relatively fertile, because they are continuously fertilized with domestic ashes, manure and household trash. These fields are the individual fields of the household head. He cultivates these fields, assisted by other members of the family. *Lowland fields* are those that are generally very humid because of their geographic location. These fields are also designated for individual use. The lowland fields are controlled by the male head of the (extended) family, although he often delegates authority for cultivating these fields to his eldest son.

The other two 'types' of fields are the so-called *champs de brousse* or *champs dunaires*: the communal or collective household fields¹⁰ and the individual fields. The collective fields are the larger fields that are situated farther away geographically from the homestead. The distinction between 'collective' and 'individual' relates to the fact that the 'collective' field is controlled by the household head and its produce used for feeding the (extended) family. In Dakiri, the size of these collective fields is on average 1.7 ha, ranging from 0.5 to 4 ha. All aforementioned fields are passed on from father to sons. It used to be the *dedano*, or the male head of the extended family, who would decide on the allocation of fields between the different male family members. If more land was required, the *dedano* could approach the village land-chief and request for more land, which would normally be granted. At the time of the study, the role of the village land-chief had diminished, which was partly a function of the reduced availability of land. When people required more land they tried to arrange this among themselves, by asking friends and relatives. The 'individual' field is controlled by an individual family member (women, girls and unmarried boys or men). Newly wed women in principle obtain usufruct rights to such fields through the 'chef de terre', but in practice it is often their father-in-law (and sometimes their mother-in-law) who designates certain portions of land to the new daughter in law. Some women also inherit these fields from their mothers (which is only possible if those fields are not too far away from the husband's

9 Most studies claim that women cannot be chefs de terre, but van Koppen encountered some female chefs de terre in the Comoé Province (van Koppen, 1998a).

10 Please note that the term 'communal' or 'collective' here does not refer to some kind of community property, but instead refers to the fact that these fields are designated to the household collectivity.

homestead), or temporarily borrow it from a relative. In case women have obtained fields from their family-in-law, they lose access to these lands upon divorce. Widowed women continue to cultivate the fields allocated to them upon marriage (See also van Koppen, 1998a: 64 and further on ways for women to obtain land).

In Dakiri at the time of the study, women mostly had several smaller plots of land located in different areas as their individual fields. Those plots were usually located at the borders of the big family fields. The average total size of these fields in the twenty studied households (according to people's own estimates) was 0.47 ha, varying between 0.16 and 1 ha. The plots that were assigned to women for groundnut cultivation were those parts of land that had previously been cultivated with millet for a number of years. These lands were degenerated, and women's cultivation of groundnuts served to regenerate it. After a number (2-3) of years of groundnut cultivation, these women's plots were taken back by the household head for the cultivation of millet and women were assigned other fields. As one old man in Dakiri explained: *"If I have a very poor millet field, I assign parts of this field to women. Some years later, I regain these fields and assign other exhausted plots of land to women where they can grow groundnuts. Groundnuts can grow even on very poor soils. If I would assign these fields to men, it would become difficult to regain them, because they might claim ownership rights to these fields."*

Women have usufruct rights to their individual portions of land, but only have a limited right to give it to others. They are allowed to give it to their daughters-in-law, or to their daughters when they live nearby. One female farmer explained the allocation of fields to women as follows: *"When I got married, my husband gave me two fields, one for groundnut cultivation and one for millet cultivation. The fact that our husbands give us fields can be compared to the fact that husbands in town give beautiful clothes ('pagnes') to their wives."* Women's access to land is conditional upon kinship and marriage relations with men. The fact that women leave the household upon marriage or upon divorce is the rationale behind this rule. Young girls, just as young boys of at least nine years old, also have their own individual fields. A schematic representation of the different users, uses and sizes of the different field is given in table 4.2.

Table 4.2. Different fields and their characteristics

Type of field	User and uses of field			
	Control	Labor provided by	Crops grown	Average size
Homestead	h of hh	All hh members	maize, sorghum, millet, tobacco, okra, cotton, etc.	n.d.
Bas-fonds	h of hh	All hh members	Sorghum	n.d.
Collective field	h of hh	All hh members	millet, sorghum, maize and others	1.7 ha
Individual field	hh members	The user, with some help of (young) others	groundnut and some millet, 'pois', beans, sesame etc.	0.47 ha

h of hh= head of household; hh = household; n.d. = no data. Source: field data Dakiri

Labor and crops

As mentioned above, the distinction between the different fields reflects the principle that lies at the basis of the way in which the harvest is divided and labor is allocated to each field. In terms of labor, the collective family fields where millet and sorghum are grown receive absolute priority. Before the first rains, almost everybody gathers in the collective fields to do land preparation. Quickly after the first showers announcing the start of the rainy season (usually in June or July), sowing of millet and sorghum starts. It often happens that sowing has to be done several times, because of the irregularity of the rains. Almost all able bodied members of the (extended) household contribute labor to these first land preparation and sowing activities, with the exception of older women (who are 'freed' from the obligation to work on the collective field) and young, unmarried, men.¹¹ There is no strict gender division of labor; women participate in all kinds of work, except for clearing previously uncultivated land. Clearing and plowing are considered men's tasks, but women often assist. Sowing is also done by men and women alike. Men often make the holes in which women put the seeds. First weeding usually takes place about three to four weeks after sowing. Many households hire labor to assist with weeding. Harvesting of millet and sorghum in the fields is mainly done by men, while women transport and bundle the harvested grains. Threshing and milling are done by women in their homesteads. When women work in the fields, care of young children and babies are taken care of by the younger sisters of the husband or household head. Very young babies are often taken along, on the back of their mothers. Household members can only start cultivating their individual fields after having complied with the obligation to work on the large family fields. Usually it is only after the third rains that work starts in the individual fields. The number of days each married woman is expected to work on these fields is a matter of negotiation with the head of the household (now most often her husband or the

¹¹ Young men who are about to marry organize among themselves to collectively work in the fields of their future parents-in-law, and they also help their fiancées with their groundnut cultivation.

father of the husband), and depends among other things on the number of dependents that have to be fed with the harvest of the collective fields. Recently married women, who have just come to live in the homestead of their husband's family, are usually not asked to contribute much labor to the collective fields. Instead, they can work on their own account or even (if distance permits) continue to work in the fields of their parental household. Before agricultural activities start, husband and wife (or wives) agree about the number of days the woman has to contribute to the cultivation of the collective field. The agreed days a woman is authorized to work on her own fields are called the 'woman's days'. Table 4.2 provides an illustration (based on the information from Dakiri) of the different intra-household agreements about the number of 'women's days' in relation to the number of days women had to work on the family fields.

Table 4.3 Number of 'woman's days' as compared to the number of days contributed to the collective field.

	Household type						
	Monogamous			Polygamous*			
	hh1	hh2	hh3	hh1	hh2	hh3	hh4
No. of days on collective field	7	3	7	6	1	2	4
No. of days on own fields	2	2	2	7	1	1	1

These are figures for one of the women in a polygamous household. Source: field data, Dakiri

Although it has become more difficult than in the past to obtain access to individual fields, all women in the sample continued to have their own fields. Yet, and unlike the situation in the past, at the time of the study most women also cultivated millet on their individual fields. The reason they gave for this is that drought and degeneration of soils made it more difficult to grow enough millet on the collective fields to satisfy household subsistence requirements. Rather than expanding the size and the amount of work on collective household fields, women preferred to increase their labor inputs to their individual fields. Older women who were interviewed about this matter, were all of the opinion that women work much more than they used to do when they were young: *"They are alert as soon as the cocks start crowing, start doing their domestic duties as fast as possible so as to have some time to devote to their personal fields, before joining their husbands to the collective fields."* Individual fields usually are located at a distance of about 2.5 km of the homesteads, and in addition to millet and sorghum women also continue to grow the 'traditional' women's crops such as groundnuts, beans, beans and vegetables such as okra. Often the fields on which women grow millet and sorghum are distinct from those on which they grow other crops, and the size of those millet fields is considerably bigger than the size of the groundnut fields. Young girls, just as young boys of at least nine years old, also have their own individual fields on which they grow their own crops. Girls usually grow groundnuts, whereas boys grow millet.

One the homestead fields (controlled by the male household head) mainly maize is grown, but also sorghum, okra and some tobacco for home consumption. Cotton is disappearing as a crop, mainly because most people no longer spin and weave their own clothes. In the 'champs bas-fonds', mainly millet and sorghum are cultivated. Next to working in the fields, and in contrast to men, women also spend much of their time on 'domestic' tasks, such as pounding millet, cooking, fetching firewood and water. As already mentioned, in polygamous households women often divide the 'kitchendays' among them, so that one of them can stay at home to pound millet and cook. A young woman with 3 co-wives for instance explained: *"When I have had my kitchen day, I have three free days to spend on my own affairs."* Women in monogamous households, in the rainy season, generally get up very early to pound millet and prepare the meal before going to the fields. Many women do the pounding at the eve of the previous day. When going to the fields, women leave their buckets and containers at the pump site, and fill them with water to take along to their homes when coming back.

Production and income

In almost all households, the harvest of the different fields is stocked separately. Usually the male head of the household constructs one big granary to stock the production of the collective fields, and some smaller granaries for each of his wives where they can stock the production of their individual fields. Although the productions of the collective field and the individual fields complement each other in how they are used, they are kept separate. As an old man explained: *"Everything a woman owns also belongs to her husband, and the other way round, but one cannot put them together."* People have several explanations for the separation of incomes and harvests. A first reason given is that such separation makes it easier to individually manage and control how the harvest is used, which is most important in polygamous households. A woman testified: *"If the granary would be collective and your parents need millet, you cannot take something out of the granary without your co-wives protesting against it. They will say that you have taken away millet from the husband to give to your parents."* Separate storage of the harvest thus allows women to use some of it to support their parents, while it also makes it possible for them to individually control the surpluses if there are any.

A second reason given is that in polygamous households every wife likes to be able to monitor and assess the contributions of the other wives, in order to verify that each wife has approximately contributed a same amount. 'Lazy' women are severely reprimanded by their co-wives. To avoid ridiculing by others, every woman makes an effort to produce as much as possible. *"If you have an individual field, you really make an effort to produce a lot. The harvest of your field is seen and appreciated by everybody, and it is consumed together. By producing a lot you earn respect. One praises you, and your husband will be proud of you; he will know that he can count on you. But if you are lazy, you cannot have a good husband - only someone who experiences difficulties to*

find a wife will want to marry you." Hence, the separation of the harvests of individual and collective fields also serves as an incentive to women to produce as much as possible, and thus serves to maximize total production. The felt need to separately store the produce of the different fields is often less in households consisting of just a man, one wife and their children and in such households it sometimes is not done.

Normally, the harvest of the collective fields is stocked in the large, collective granary. Use of the millet and sorghum from these granaries is controlled by the household head. In fact, it is considered the responsibility of the household head to manage agricultural production of cereals (millet and sorghum) in such a way that production is sufficient to feed the entire (extended) family year round. Married women can either serve themselves out of this granary when it is their turn to prepare meals, or the household head allocates shares to each of the "kitchen units" or "hearth-holds" comprising an adult, married, woman with her children. If the production of the collective fields exceeds consumptive requirements, the surplus is controlled by the household head. He can use it for savings in the form of livestock, or he can use it to buy clothes for other household members as a token of appreciation for their labor inputs.

Whatever is produced in the individual fields is stocked separately from the cereals produced on the collective fields. The one who is designated as the main user of the field also controls the harvest. One man explained: *"A woman never stores her millet in the same granary that her husband does. In our region, it is like this. It is what our parents have done. A man has his own properties and a woman has hers; it has been like this since time immemorial. If the production of the man is not enough, the wife gives hers to the household members."* This does not mean that women are completely free in deciding how this harvest is to be used, since all household members do have the obligation to contribute to the survival of the family. If the year's harvest of millet and sorghum is insufficient, women are expected to complement the supplies of the collective, male-controlled granary. A woman explained the way in which production of the different fields was shared in her household as follows: *"When the husband's production is likely to be enough, we give him a small share of our millet or we sell and give him some money. When we expect a shortage of millet, we put all our productions together and consume everything. We give half of our harvest if the food shortage is minor. However, she who has more children has to contribute more; it is the husband who has decided it like this. He says that we (four women) should not give the same quantity. I, for example, have two kids and I give one bag and one tin (117 kg). The fourth wife has one child and gives three or four tins (51-68 kg), depending on her production"*. Newly wedded women, who do not yet have children of their own, are relatively freer to decide on how they want to use the production of their individual fields. They often continue to support their parental families. As soon as women have one or more children, a large part of what is produced has to be used for feeding and clothing the children. However, even if the entire production of women's individual fields is spent on meeting household consumption needs, the contribution of women (in terms of size) is clearly recognized. In polygamous households, the different women who are

married to the same husband monitor each others' production and the size of their respective contributions to the household. Arguments between women married to the same husband about the size of their contributions are common.

While surpluses can in principle be individually controlled and used, the main use of the harvest of individual fields is consumption and gifts. There are very few women who succeed in growing enough to sell part of the harvest. In most years in Dakiri, women do not sell any of the millet produced on their own fields; all is used either for feeding their own household or for helping out their parents. On average, a woman's contribution is around 330 kg per year, as compared to the average production from the collective field of around 1950 kg per year. The harvest of groundnuts is the exclusive property of women, and they can decide on its use. After the harvest, women usually give a share of it to the head of the household while keeping the rest as an emergency stock to be sold or exchanged when a need arises. They can also use these individual 'earnings' to support their own parents and kin. On average, the women in the study produced some 58 bags (of each about 100 kg) of groundnuts, of which they sold about 69% (or 40 bags), while keeping the rest for seeds (8 bags), own consumption (6.5 bags) and gifts (3.5 bag).

Understanding intra-household decisions and gender relations

In line with conceptualizations of households by Guyer and Peters (1987), Whitehead (1981), Sen (1989 and 1990), Folbre (1986, 1996), and Agarwal (1997a) the households in the studied locations can be characterized as domains of cooperative conflict.¹² There is cooperation between the different household members in respect of the collective goal of household survival, or in respect of the goal of earning enough income or growing enough food for ensuring the survival of all household members year-round. Intra-household conflicts basically occur when production fails to meet consumptive requirements, or when there is disagreement about the intra-household sharing of produced surpluses. Such conflicts may take the form of disputes and arguments between male household heads and their wife or wives about the amount of days a woman is entitled to work on her own fields, as compared to the amount of work she has to contribute to the cultivation of the collective field. They may also be about the amount of income or produce from individual production (or income generation) a household member has to contribute to the household collective.

The main difference between the different members of a household lie in (1) the possibilities they have to produce surpluses (or to have individual savings, usually in the form of livestock), and (2) the use of these savings. Male heads of households have an interest in increasing the outputs of the collective family fields, because the surplus of these fields is owned and controlled by them. The other household

¹² Reviews of thinking on and conceptualizing households are given by Kabeer, 1991; Agarwal 1997a and O' Laughlin 1999.

members (young, unmarried men and women and married women), instead have an interest in increasing the outputs of their individual fields. This is why household members, other than the male household head, have an interest to keep their labor contributions to the collective fields to a minimum, so that they can spend more time on their individual fields. Household heads, in turn, would rather see other household members increase their labor contributions to the collective field, because this would lead to a higher production. Negotiations and conflicts, either about the amount of labor individual household members contribute to collective fields or about the share of their individual produce they contribute to the household, may occur between the male household head and one other household member, but they may also occur between other household members, as for instance between several wives of one husband if one of them feels that she contributes too much as compared to what others contribute. The amount of labor each married woman has to contribute is related to the number of children that she has to feed; in principle, the bigger the number of children, the more work she has to do on the collective fields.

Hence, and slightly different from what many earlier analyses suggest, it is not so much male control over women's labor per se that women resist, but it is the control over production surpluses. Conflicts arise either when production from all different fields is not enough to meet household consumptive requirements, or when there is unfairness in the distribution of surpluses. The resolution of such conflicts may either consist in a re-negotiation of the amount of labor women contribute to collective fields, or in a re-negotiation of the remuneration of this labor (sometimes directly in that male household heads give some of their savings to women, for instance in the form of clothes (*pagnes*), or indirectly in that women keep more of their own savings). If women feel that their husbands fail to comply with their obligation to 'provide', they can threaten them with divorce. In Burkina Faso, women can leave their husbands, whereas husbands can never leave their wives.

Although the often made suggestion that patrilocal marriages create additional vulnerabilities for women (on account of the fact that they have to leave their families, friends and social networks) remains true, it is also true that women, unlike men, have the possibility to leave their husbands. This is rather common and not as strongly morally condemned as it would be in many Western European or Southern Asian countries. Various interviewed persons in Dakiri were of the opinion that divorces occur more often now than in the past. One male farmer tried to explain this as follows: "*There are some lazy men who refuse to work correctly in the rainy season. They spend most of their time in the market, even though they are not traders. These men leave all the work to the women and children. This is why some women decide to leave their husbands. Their husbands do not comply with their responsibilities towards their families.*" Women, instead, claim that it is mostly the fact that their husbands 'collect' many women and their reluctance to live in a polygamous household that accounts for the large number of divorces. (More than half of the households in Dakiri were polygamous.) Another frequent reason for splitting up is when a married woman does not have children in the first years after the marriage, or when she only has

miscarriages. In such a case, her parents may suggest that their daughter re-marries someone else so as to try her luck with another man. The solution that is more frequent in such cases is that the husband marries a second wife, while the first wife continues to live with him, even without children. For a woman not to have children is quite unacceptable and reflects very negatively on her status as a woman. Only having daughters is likewise not judged very positively, because the daughters will all leave the house one day. When a woman leaves her marital household, she usually rejoins her parental household where she very soon starts a new life. The relative freedom to leave their husbands obviously gives women some autonomy and power. Most men are reluctant to see their wives leave, if only because of all the investments they have had to make to be allowed to marry them (work for a couple of years in the fields of the parents-in-law, payment of bride wealth and two 'pagnes noirs' and payment of the engagement festivities.)

In the Gulmacé society, women are also relatively free to choose their own husbands, there are no 'forced' or arranged marriages. Young people agree among themselves that they want to marry. When a young woman wants to marry a young man, he has to start working in the fields of her father for several years. He thus obtains the 'right' to marry her, and it would be difficult in such a case for the woman to change her opinion in favor of another man. Only if a young man refuses to assist his future father in law in the fields, the parents of the woman may request her to leave the man to save the honor of the family.

Irrigation and gender relations

In this section, I analyze how the introduction of irrigation has interfered with the above described intra-household organization of production. I already mentioned in the introduction that this analysis is inspired by the hypothesis that the allocation of irrigated plots to both women and men would be a favorable change from the 'normal' plot allocation practice in most irrigation projects that tended to favor men – both in terms of productivity as in terms of gender equity. The analysis therefore focuses on the comparison between households in which only men have received irrigated plots, with those in which also women obtained plots.¹³ I start by reconstructing plot allocation in Dakiri, against the background of plot allocation practice and tenure laws in the rest of Burkina Faso. I continue with a short reminder of the fact that irrigated agriculture is only one element of the livelihood strategy of most Dakiri households, and then proceed with the analysis of the different arrangements households have made to 'free' labor for irrigated agriculture. The analysis was done in the rainy season, because this is the season where *both* rained

¹³ A survey done in 1993 among 114 plot-holders showed that 23% of them share 2 to 3 plots among household members, and 11% of them even have 4 to 5 plots. The rest, some 66%, have only one plot in their household (Le Vu, 1994).

agriculture and irrigated agriculture are practiced and where, as a consequence, competing demands on labor and resulting gendered conflicts are most likely to occur. In what follows after the analysis of labor arrangements, I first compare the productivity of different plots, and then look at how the proceeds of irrigated farming are used by different plot-holders.

Land tenure and plot allocation

The changes in land policy in Burkina Faso over the past decades explicitly favored women's interests. The Burkina state has adopted two comprehensive land tenure policies: the *Reorganisation Agraire et Foncière* (RAF), enacted in 1984 amidst the revolutionary fervor of the Sankara regime, and the *Gestion de Terroir* approach, embraced during the more conservative Compaoré regime (Kevane and Gray, 1999). The RAF stipulates that land is 'owned' by the state, and agents of the government have the right to supersede the claims of the *chef de terre*. The policy further stipulates that women, just as men, have the right to own land in towns and rural areas, irrespective of marriage status. The policy has a special section on irrigated areas. Article 2 of this section stipulates that irrigated lands can be allocated to people only if they have access to a minimum of labor ("Avoir un minimum d'actifs avec soi"). This rule tends to exclude women, since women are thought not to have access to labor and the labor that is referred to is often women's labor to which men have a right because of marriage (PSF, 1993:4).

Yet, in reality, land tenure policies and laws have had little effect on actual plot allocation in irrigation systems (Abernethy, 1994). In most irrigation systems in Burkina Faso, the number of plots to be attributed was much less than the number of people interested in obtaining a plot, which is why allocation practice aimed at reducing the number of potential candidates.¹⁴ Actual plot allocation was delegated to plot allocation committees headed by village heads. Plot allocation committees had a tendency to give priority to male heads of households so as to avoid that more than one plot be allocated to a household. In most irrigation systems in Burkina Faso, the number of women who received access to irrigated plots is very low. A survey done in 1993 in 9 systems showed that, at that time, there were 1% female plotters for 8 of the 9 systems in the survey. The one system in the survey with a higher number of female plotters (11%) was an irrigation system where (in contrast to the other systems) a special effort was made to provide plots to traditional rice growers, who were women in this area (PSF, 1993:9).

In this regard, the Dakiri irrigation system is an exception. Here, the number of women who received a plot is still very low (9%), but significantly higher than in other systems. A reconstruction (based on interviews) of the plot allocation process

14 Van Koppen provides an elaborate description of plot allocation policies and practices in the different irrigation schemes in the project 'Opération Riz' in the Comoé Valley. Her analysis shows how the allocation of plots to households was one strategy to reduce the number of claimants, a strategy which categorically nullified the land rights of women. (van Koppen, 1998a:78).

in Dakiri showed that the president of the male village group in Dakiri played a crucial role. He was one of the main initiators and organizers of the irrigation development effort that shaped the latest plot allocation, in 1983. He, together with the agricultural extension worker of that time, was in charge of informing the representatives of existing neighboring village groups about the project plans. The legal rule that one needed to have access to a minimum amount of labor was not adhered to. There was no explicit gender discrimination: everybody without exception could in principle register for participation in construction works and thus become eligible for accessing a plot in the irrigation system. In spite of this lack of explicit gender discrimination, the irrigated plots were in large majority allocated to men. One obvious reason for this was that women were not as well informed as men. First information about the project was circulated to male village groups only, and most women were simply not aware of what was going to happen. Many of those who registered for participation in construction works were members of the Dakiri all-male village group. What convinced many others of participating was not so much the promise of access to an irrigated plot, but rather the fact that those who participated in construction works were given food through the World Food Program.¹⁵ For most women, the distance of the scheme from their homes was an additional and quite strong disincentive. Like men, a lot of women were hesitant to invest time in construction because they had difficulties believing that their contributions would actually be rewarded with an irrigated plot.

For some women it was difficult to apply for participation in construction works, because their husbands resisted it basically out of fear that their wives would be harassed by other men "hiding in the high grass of the plains", or would engage in relationships with other men. Not all men were resistant, though. Of the women who were enlisted, many were in fact registered by their husbands. Especially the members of the Dakiri village group, men who realized the benefits of irrigation, were keen to register the female members of their households. According to the head of the Dakiri male village group, *"Women were not denied access to plots. Only those who had listened to the advice given by the extension worker have obtained access to plots. In my extended family, for instance, there were many people, but only 13 women and 10 men accepted to participate in construction works. At that time, people thought it was a bad thing to work in the project. Today, many regret their earlier attitude. They borrow plots of others to work there in the dry season, because there is no other way of benefiting from the irrigation system."* *"Women and men are not alike"*, said a woman who recounted plot distribution, *"women follow men, and when men earn, they share it with women. If it was to be re-done, all women would happily participate"*.

The overall impression obtained through interviews is that actual plot allocation practice was less the result of formal land tenure laws and allocation procedures, than it was the outcome of negotiations and networking of those (mostly men) with

¹⁵ Once a week, participants would receive 1 bag of flour for 4 people, 1 bag of milk powder for 10 people and 1 can of oil for 4 people.

some influence in the region. Especially the head of the Dakiri male village group played an important role, and he also was instrumental in making sure that the women of his village (and especially those belonging to his extended family) obtained access to plots. The actual distribution of plots among the different villages and among men and women in these villages (as given in the table below) still reflects the influence of the president of the Dakiri male village group.

Table 4.4. Plot ownership in Dakiri

Bloc no	No of plottolders	Gender of plottolders		Size of plots		Village
		Male	Female	0.16 ha	0.08 ha	
1	44	44	0	43	1	Liougou
2	35	35	0	35	0	
total village	79	79	0	78	1	Liougou
3	47	47	0	47	0	Lipaka and Laama
total village	47	47	0	47	0	
4	46	45	1	46	0	Tambindi
5	40	39	1	40	0	
total village	86	84	2	86	0	
6	45	42	3	45	0	Dakiri
7	44	42	2	44	0	
8	43	39	4	43	0	
9	44	35	9	38	6	
10	39	26	13	39	0	
total village	215	184	31	209	6	Dakiri
11	44	38	6	44	0	Nagbiougou
12	47	44	3	42	5	
13	47	44	3	47	0	
14	71	63	8	52	19	
total village	209	189	20	185	24	Nagbiougou
15	46	45	1	38	8	Siedougou and Saint Djabdé
16	58	48	10	43	15	
total village	104	93	11	81	23	Siedougou and Saint Djabdé
Total	740	676	64	686	54	

Source: field data, Dakiri

The relative importance of irrigated agriculture

The introduction of irrigation offered Dakiri households the possibility of increasing yearly agricultural output. However, irrigated agriculture did not replace rain-fed agriculture.¹⁶ Rather, farm households used the irrigated production to supplement

¹⁶ That irrigated agriculture was only one element in livelihood strategies is contrary to the normal Engineering views. Typically, the engineering paradigm was based on the assumption of monocropping, and consequently estimated optimal productivity and performance levels assuming that all available labor and other farm inputs would be mobilized and used for the production of irrigated crops.

rain-fed production. Having access to one or more irrigated plots helped households to meet yearly consumption requirements. For the 16 sample households¹⁷, the produce from the rain-fed farms accounted for about 70% of the household's total production of basic grains (millet and rice) when expressed in kg (figures are based on average productions in kg of millet and rice). Irrigation production was nevertheless much more important when calculated in terms of monetary value rather than in terms of quantities produced, since 1 kg of rice was worth the equivalent of 1.8 kg of millet at the time of the harvest.¹⁸ Since most households used to sell most of their rice harvest in order to buy millet, this way of assessing the relative importance of irrigated agriculture is more relevant. Depending on the number of plots per household, this varied between 35% and 44% of the total value of cereal production.

The introduction of irrigation did not fundamentally change the agricultural production strategies of households in the studied area. In all but one of the 16 studied cases, the collective family field, where millet and sorghum are grown, continued to be the basis of the household diet and continued to receive priority in terms of labor investments. Irrigated fields provided an important addition to the diet and incomes of households. As many interviewed farmers explained, the size of irrigated plots was far too small to serve as the sole source of income and food. Only some widowed 'freed' women relied entirely on the proceeds of the irrigated plot for their survival. One could say that the access to irrigated fields had made it possible for many families to continue to live more or less as they used to. "*Without the irrigation system, we would have been forced to leave this area in search for fertile lands elsewhere*".¹⁹

Intra-household labor arrangements for irrigated agriculture

One of the specific objectives of this study was to analyze whether it made a difference in terms of labor allocation and productivity when plots were allocated to men or to women. The background of this question was the resistance in irrigation policy and technical assistance circles against allocation of plots to women, a resistance that was often justified by fears about loss of productivity (and sometimes by fears about provoking the break-up of marriages). Yet, some of the studies

17 The analysis presented here is based on 16 of the 20 sample households, because 4 female-headed households have been left out of the analysis. The main reason is that these households consisted of so-called *femmes libérées* – older women whose children had grown-up and who were freed of the responsibility to contribute labor or food to the household as a whole. These women, therefore, basically cultivated their irrigated plots as individual plots and they themselves also controlled the income from it. These cases were interesting, but did not reveal much about intra-household rights and responsibilities.

18 The value of rice in comparison to the value of millet changed slightly with the amount of time that had passed since the harvest and was about 1.5 the value of millet at its lowest.

19 See also Diemer and Vincent (1992), who state that the introduction of irrigation technology is often used "to repair a farming system in distress" (Diemer and Vincent, 1992:139).

already referred to about the introduction of irrigation in Africa suggested that one of the main reasons for their poor performance was the fact that women, after one or two seasons, withdrew their labor if they could not share in or benefit from the harvest (Carney, 1988 and 1998; Jones, 1986). Problems of male plot-holders to mobilize enough female labor severely depressed cropping intensities and yields. Would their security of harvest control, and thus their willingness to invest labor, increase if women were also allocated their own plots? And would this be one possible key to increasing the performance of irrigation systems in Sub-Saharan Africa?

To answer these questions, plots allocated to men were compared to plots allocated to women, in terms of how labor was organized and mobilized for irrigated production. Estimates of how many working days people had spent on the various plots were obtained by asking people, through interviews, just after the rainy season. These data provided rather rough estimates, based on people's memories. Most precise and accurate were probably the numbers women gave for the amount of time they had worked on the fields controlled by their husbands or fathers, since these reflected previous agreements about the 'women's days'. Because many women did not work full days in their own plots or fields, but went there whenever time was available, it was not as easy for them to exactly recount how much time they had devoted to working in their own fields as it was to estimate the time they worked on the collective fields. This explains why numbers obtained for individually controlled female plots are remarkably lower than those for male plots.

Overall, most families with access to irrigated plots continued to give priority to the collective rain-fed fields. As soon as the rains announced themselves, all available labor was mobilized to start preparing these fields. This often meant that the starting date of the work in the irrigated plots was later than what would have been optimal from the point of view of maximizing productivity on irrigated plots.²⁰ Viewed from the perspective of the combined farm activities, delaying land preparation and transplanting on irrigated plots was nevertheless quite understandable. A delay in commencing the irrigation season was much less risky than a delay in starting rain-fed millet cultivation on account of the security offered by the storage reservoir. Hence, most households wanted to first finish the sowing of the rain-fed fields before embarking on irrigated production. Since labor was the most critical factor of production, there was a limited capacity to increase total labor contributions to agriculture so as to meet additional labor requirements for irrigated plots. This meant that either part of the labor used in irrigated production (again in the rainy season) would have been otherwise used for rainfed agriculture, or additional labor would have been needed by for instance hiring it.

The collected data show that households spent between 12% (15 of 124 days) and 30% (54.5 of 183 days) of their total labor investments (205 days on average) on

²⁰ The fact that most people start late with the cultivation of irrigated plots was in fact repeatedly diagnosed as one important factor in depressing agricultural productivity of irrigation systems in Burkina Faso and Niger. See for instance Sally and Abernethy, 1993.

irrigated fields. In those households where both men and women had irrigated plots (10), this average was slightly higher (20% (41.5 of 207 days)) than for those households where only men had plots, where 17% of total labor investments (35 of 203 days) were invested in irrigated fields (total labor investments are taken to be the total number of days devoted to agriculture of that specific household). The busiest period was when the rains started. At that time, the irrigated plots had to be prepared as well as the millet fields. Female and male farmers would either divide their working days between the two activities, working on the millet fields in the morning and in the plots in the evening. Sometimes they also dedicated some days of the week to the irrigated plot, or they divided the work responsibilities between the different household members.

Male and female plots

During the interviews and when interpreting the results, it became clear that how labor was mobilized for specific irrigated plots not just depended on the gender of the plot-holder, but also on whether the irrigated plot was considered as a *collective family* plot or as an *individual* plot. For those plots registered in men's names, three broad patterns of patterns of labor allocation could be distinguished, as represented in table 4.5. The first (m1) was that most labor for irrigated rice production was hired. In one of these two cases, the male plot-holder himself was quite old, while his sons worked in the fields of their parents-in-law. Hired laborers were in one case assisted by a daughter-in-law of the male head of the household, in the other by a son. *"In the rainy season, I have my plot worked by hired laborers, and I take care of the big fields. When the rice is ready for transplanting, I come with my family to transplant in one day."*

In the second pattern of labor allocation (m2), occurring in nine of the 16 sample households, the irrigated plots were more or less considered as collective fields, and labor allocation was done in a similar fashion as for the collective millet fields in four of those households. All family members together worked together on the irrigated plot, just as they did in the millet fields. Some went to the rain-fed fields in the morning and attended to the irrigated fields in the evening. In three households, the wives of the plot holders only helped with work in the irrigated plot to comply with the responsibility to provide labor to collective fields, and had stopped contributing labor to the millet fields. These were all households in which women did not have plots. In two households, responsibility for the irrigated plot had been delegated to a son, who worked there with help of other family members.

Finally, in five of the studied households (m3), the irrigated plot was considered as an individual plot. In two of those, it was the individual plot of the male head of the household (comparable to a *champs de case* or *champs bas fonds*). *"In the sowing period, the family is divided. Very early in the morning, I go to the irrigation system to work on my plot. My wife and children go directly to the millet fields. I have, in such periods, almost the sole responsibility for the plot."* In two of them it was the individual plot of

one of the sons, and in one of them it was the individual plot of one of the daughters. In the latter three cases, the male head of the household had delegated almost all work responsibilities for all fields to the children, because of old age. In these three cases, it was not entirely clear who controlled the harvest from the irrigated fields.

The following table presents an overview of the patterns of labor allocation for plots registered in men's names.

Table 4.5. Labor allocation to male plots

Pat.	Number of days worked (per category of labor)							Remarks
	hh no	FA	MA	chf	chm	oth	tot	
m1a	1	0.00	0.00	2.00	0.00	8.50	10.50	
m1b	13	4.00	3.00	0.00	4.00	20.00	31.00	Mhoh is old (65)
m2a	2	6.50	5.50	0.00	3.00	5.50	20.50	
m2a	4	3.50	2.50	1.00	2.00	8.50	17.50	
m2a	6	4.00	4.50	0.00	2.00	6.00	16.50	
m2a	9	11.00	18.00	3.00	0.00	3.00	35.00	
m2b	10	7.00	15.00	8.00	0.00	5.00	35.00	FA do not work in collective fields
m2b	12	13.00	15.00	0.00	0.00	17.00	45.00	FA do not work in collective fields
m2b	16	13.00	30.00	0.00	0.00	5.00	48.00	FA do not work in collective fields
m2c	5	5.50	0.50	8.00	10.50	1.00	25.50	
m2c	14	13.00	5.00	0.00	23.00	11.00	52.00	
m3a	8	0.00	22.00	0.00	0.00	3.00	25.00	FA do not work in rice fields
m3a	11	1.00	23.00	0.00	0.00	4.00	28.00	
m3b	3	2.00	0.50	2.00	25.00	4.00	33.50	Mhoh does not work anymore
m3b	15	1.00	3.00	1.00	10.00	0.00	15.00	
m3c	7	3.00	3.00	14.00	0.00	16.00	36.00	Mhoh does not work anymore

FA = Female Adult, MA = Male adult; chf = daughter; chm = son; oth = other; tot = total; Mhoh = Male head of household; m1 - m3 refers to my categorization of the organization of labor. Source: field data, Dakiri

As for the plots registered in the names of women, in five of the six cases studied (f1) these were considered as individual plots, comparable to women's groundnut or millet fields. The irrigated plot was either entirely controlled by the female plot-holder herself or by one of her daughters-in-law. In one case (f2) the female plot was more or less considered as a collective field and labor allocation was done in a similar fashion as for the collective millet field.

Table 4.6. Labor allocation to female plots

Cat	Number of days worked (per category of labor)							Remarks
	hh no	FA	MA	chf	chm	oth	tot	
f1a	1	23.00	0.00	0.00	8.00	2.00	33.00	1 f plot in polygamous hh
f1a	2	12.00	0.50	0.00	3.00	4.00	19.50	1 f plot in polygamous hh
f1a	3	12.00	3.00	2.00	0.00	4.00	21.00	1 f plot in polygamous hh
f1b	5	3.00	0.00	12.00	0.00	1.50	16.50	
f1b	6	1.00	0.00	6.00	2.00	0.00	9.00	FA mostly works on col. fields
f2	4	11.00	12.00	0.00	0.00	3.00	26.00	4 f plots in polygamous hh

FA = Female Adult, MA = Male adult; chf = daughter; chm = son; oth = other; tot = total; Mhoh= Male head of household; f1 - f2 refers to my categorization of the organization of labor. Source: field data, Dakiri

Labor allocation among plots

The analysis shows that actual labor allocation patterns are not just a function of the gender of the plot-holder, but also depend on the designation of the plot, on the specific position of the plot-holder in the household, and on the overall livelihood strategy of the households and of its members. Whether a household consisted of polygamous or monogamous couples also mattered. In the case of monogamous households who lived (quasi-) separate from the husband's parents or brothers, chances were far more likely that husband, wife and children worked together on all fields and plots without keeping a very strong distinction between who controlled the plot or field, and sometimes also without keeping the harvests separate. In polygamous households, except in the case where all women had an irrigated plot (case f2), husbands more rarely assisted their wives with the work to be done in the plot or in women's individual fields. Also, when not all co-wives had irrigated plots, female plot holders were less likely to be assisted by their co-wives in their plots.

Other factors also came into play. For instance, in some households, young adult men were working in the fields of their future parents-in-law and were thus not available for helping in the fields or plots of their parents. In others, the head of the household was too old to be able to contribute much labor. Although he continued to play a role in managing and monitoring agricultural production, he himself did not or hardly work anymore. In one household, the (one) wife of the male head was likewise not physically fit enough anymore to work much in the fields, although she continued to provide some labor to the irrigated plot of her husband. Also, in some households there were one or more 'femmes libérées' (liberated women), older female members of households who were 'freed' of their obligation to contribute labor to the collective fields. These women did sometimes continue to help somewhat on the fields of their husband or sons, but dedicated most of their time to working on their individual fields. There were also some households whose female members did not work in the irrigated fields on account of the belief that "women should not direct themselves to the East". Of the families

living west of the irrigation system, many gave this reason to account for the non-participation of women in irrigated agriculture. One woman explained: *"I should not direct myself towards the East. I have once been to the irrigated plain and when I came back I fell ill. This is why I never go there anymore"*.

Although the small size of the sample does not allow firm generalizations, a few conclusions about the effects of also allocating plots to women can be drawn. When counting with averages from the 16 sample households, the hypothesis that women contribute more to irrigated plots when they control the proceeds (that is, when the plots are in their names) can be confirmed, both in absolute as well as in proportional terms. Thus, in those plots that are considered as male individual fields women only contributed 1.75 days of labor on average (or 7% of total labor contributed to this plot), against men's contribution of 20.88 days on average (or 83%). The balance between male and female labor was more equal in those plots that were treated as collective family plots: women contributed on average 10.75 days (34%) and men 14.85 days (44%). To those plots that were considered as women's individual fields, women contributed on average 14.67 days (69% of all labor) and men 3.25 days (15%). Hence, it would be possible to roughly deduce from the amount of labor people invested in plots to whom the control of its proceeds would accrue: in male individual plots, mostly male labor was invested; to plots that were treated as irrigated extensions of the millet fields the contributions of men and women were about equal, and to those plots that were considered as women's individual fields, women provided most labor.

To look at it in a different way: when irrigated plots were considered as collective plots, 9% of the total amount of labor women dedicated to agriculture (95.94 days on average) was spent on this plot, and 12% of the total amount of men's labor (80.44 days). When the male plot was an individual plot, these percentages were 2% and 21% (of a total of 76.67 and 69.67 days in total), respectively. When the female plot was an individual plot, they were 15% and 4% (of totals of 97.80 and 77.30 days). Or, the relative amount of labor people are willing to invest in irrigated agriculture increases with the degree to which they expect to control, or benefit from, the incomes from this plot.

Whether women had a plot or not did not seem to directly affect the designation of male plots as either collective or individual. One or several of the considerations given above appeared to determine this, as did the size and the productivity of the collective millet field. If the millet field did not yield enough to feed the household, the household head might decide to also consider his irrigated plot as a collective field. Also, in some households in which women did not have plots, the lack of experience women had with irrigated production prevented them from contributing much labor to rice cultivation. Total labor contributions to irrigated plots were significantly higher (11.5 days) when these plots were designated as collective plots (32.10 days on average for collective plots, against 20.65 days on average for individual plots), but again this may be partly explainable by the mentioned reporting errors about women's time investments in their own plots.

Although everybody had to make difficult choices about how to best divide the available labor among the different productive activities, the evidence did not suggest that for women it was substantially more difficult than for men to mobilize enough labor for irrigated crop production. It is nevertheless true that men had, in general, easier access to labor, especially to that of children, than women. The total average amount of labor invested in female plots was 20.82 days, whereas this figure for male plots was 29.63 days, suggesting that 8.81 days more labor (on average) was invested in male plots. This figure needs to be taken with some caution, however, both because most female plots are individual plots whereas most male plots are collective plots and because of the aforementioned difficulty women have to correctly estimate the amount of time they have invested in their own plots. When limiting the analysis to those plots that are considered individual plots, the total average amount of labor invested to male plots is 25.38 days, and that to female plots 19.80 days - a difference of 5.58 days.

Total labor contributions to irrigated land appeared to increase with the allocation of plots to women. When comparing all households in which women did not have plots with all households in which women had plots, total labor allocations per ha to irrigated plots were higher in the latter (about 10 person-days). It makes more sense, however, to limit the comparison to the cases where male plots were considered as collective plots, because these are the cases where women (and young men) had an obligation to contribute labor to the plot. Did women contribute less labor to male fields and to irrigated agriculture when they had their own plots? The data do indeed suggest that when male plots were considered collective plots, women who did not have their own plots contributed more labor (13,5 days) to those plots than women who did have their own plots (about 7 days), and total labor contributions per household were also highest in those cases (hh no. 9, 10, 12, 14 and 16), 43 days on average against 20 days when women did have plots. However, when discussing this phenomenon with female plottolders, they all said that their access to a plot had not influenced the amount of labor they contributed to male controlled plots and fields: *"We help each other in the rain-fed fields and in the irrigated plots. If you would not have been here to interview us, I would have been working in the collective millet fields and this evening, I'll go and work on my irrigated plot."*

When comparing labor allocation patterns across households in terms of the allocation of each category of labor to the different fields as a percentage of the total amount of labor contributed by that category to all fields, the difference between households in which women have plots and those in which women do not have plots is less stark. Such comparison reveals that (again for the case when male plots are considered as collective plots) households in which women had plots spent on average 70% of the total labor invested in agriculture to male plots and collective fields, and in total 18% of their labor to irrigated agriculture. The proportion of women's labor was respectively 54% for male fields and plots and 18% for irrigated plots. In households where women did not have plots the relative amount of labor invested in male plots and fields was somewhat higher (77%), and that invested in

irrigated plots also (20%). In these households, women contributed on average 56% of their total labor to male fields and plots and 15% to irrigated plots. It may thus be that women slightly reduced their labor contributions to collective fields when they have their own irrigated plots. Such reduction is nevertheless compensated by their higher contributions to collective expenditures, as is elaborated in the next section.

In all, the study findings suggest that there is little ground for the fears of policymakers that plot allocation to women will reduce returns to investments. At least, it will in itself not substantially reduce overall labor contributions to irrigated agriculture. Although many more factors come into play, women do indeed appear to be more motivated and willing to contribute labor to irrigated production when it concerns their own plots, or when they also have their own plots.

Productivity of irrigated plots

One of the reasons that is often given to justify allocation of plots to male heads of households only, is that women will not be able or capable of producing as efficiently as men, either because of the lesser ability to mobilize labor or because of lesser technical skills or less physical strength. Such doubts have generated quite some research comparing the productivity of female farmers with those of men. Most of these studies, however, do not take the intra-household organization of agricultural production into account and consider all farmers as individuals, basically using the model of the rational entrepreneur of neo-institutional economics to explain behavior and motivations. While doing the study I also yielded to the temptation of comparing the performance of female farmers with that of male farmers, by making use of the already collected yield data. The only crop cultivated on the plots was rice.

In Dakiri, the question about differences in agricultural performance between men and women was met with some surprise. Most interviewed female and male farmers in Dakiri (60% of the women, and 35% of the men) were of the opinion that there is no difference in agricultural performance between men and women. Some women added that women can produce as much as men provided they receive some help or assistance from their husbands or other male relatives. Of the interviewed women, 36% said that it was difficult for women with small children to perform well. One woman explained, *"I am working in the fields with my baby on the back. If the child starts crying, I am forced to stop working for a while. Except for that, the work is not difficult. Plowing with the hoe is heavy, but I hire laborers to take care of that."* One third of the interviewed men mentioned that women may have too little time to devote to their crops because of their domestic duties. Another 35% were of the opinion that women are better rice cultivators than men, primarily because they are much better and more careful when weeding their plots. Some men also said that women are more patient. One male respondent even claimed: *"If you see a poorly maintained plot, with a lot of weed growth, it is always a man's plot and never a woman's plot."*

The production figures, as presented in table 4.6 confirm these opinions. To be able to fairly compare the production of the different plots, a distinction was made between different qualities of plots: plots without problems, waterlogged plots and high plots (which are difficult to irrigate). The figures show that the average agricultural production of women's plots was slightly higher than that of men's plots in the case of plots without problems, and in the case of high plots. It was only for waterlogged plots that the average production of women's plots was slightly less than that of men's plots. Hence, the fact (established in the previous section) that men are better able to mobilize labor and the overall higher labor contributions to male plots did not result in a higher production of these plots. Also, the fact that one or more wives of male plot-holders had plots did not negatively affect the productivity of male plots. This is shown in table 4.7 which compares average agricultural productivity of men's plots of households in which a man and at least one woman have a plot with those in which only men have a plot. The comparison reveals that agricultural productivity for the first category of households is identical to or higher than that of the second category of households.

Table 4.7. Agricultural productivity of irrigated plots in T/ha

Year	PWP		WLP		HP	
	Men	Women	Men	Women	Men	Women
1991/1992	5.81	6.37	6.38	5.32	4.21	4.39
1992/1993	5.31	6.04	6.50	6.26	3.22	3.67
Average	5.56	6.21	6.44	5.79	3.72	4.03

PWP = Plots without problems; WLP = Waterlogged plots; HP = High plots. Source: field data, Dakiri

Table 4.8. Agricultural productivity of male plots per category of plotholder in T/ha

Year	PWP		HP	
	WP	WNP	WP	WNP
1991/1992	6.00	5.63	4.68	4.08
1992/1993	5.07	5.13	3.88	2.80
Average	5.53	5.38	4.28	3.44

WP = Wife has a plot; WNP = Wife has no plot; PWP = Plot without problems; HP = High plots. Source: field data, Dakiri

The analysis shows that the allocation of plots on an individual rather than a household basis did not decrease productivity of irrigated land, and might even have slightly increased it. Productivity of labor based on the available figures for labor contributions (and taking into account that figures for women's labor are deemed to be on the low side for reasons already given) showed that there was no significant difference between women's plots and men's plots for households in which both men and women had plots: it was a little over 60 kg per person-day. For those households in which only men had a plot, labor productivity was less than

half, about 25 kg per person-day, suggesting a sharp increase in the efficiency of labor use when women also have plots.

Distribution of benefits

The intra-household distribution of the proceeds of irrigated farming was very much a function of the productivity of the rain-fed plots. When the harvest of millet from the collective field was too low for feeding the entire household, the harvests from the individual plots (both rain-fed and irrigated) were first of all supplementing the lack of millet in the collective granary. This, according to the interviewed farmers, was the case in most years: the larger part of the irrigated production was directly used for household consumption. According to the explanations of one woman: *"My husband uses the income from the sale of rice to buy millet, because we never produce enough. Since our arrival here, we have always had to buy millet."* Another woman said: *"If my husband's production of millet is insufficient, I give him my earnings so that he can buy millet. I always have to do this, because there is never enough millet."* In the occasional year the production of millet from the collective rain-fed field would be enough, proceeds from individual rain-fed fields and irrigated plots could be used for other purposes. Men usually invested in livestock, which is the traditional means of saving. One male farmer: *"It looks as if my millet supplies will be enough this year. I will buy animals so that if there is a very dry year, I can sell some to overcome food shortages"* Sometimes, men also bought clothes for themselves and their children, and some husbands sometimes spent part of their income for meat or fish, to purchase a radio or a small motor cycle or for other personal needs.

Women usually used their incomes, or what was left of it after household food requirements had been secured, to meet various household needs. They could use it to buy fuel wood, spices, kitchen utensils, etc. If there was money left after all expenses were met, women also invested in livestock and in clothes for themselves and their children. Table 4.8 shows how male and female plot-holders used production from their irrigated plots, while table 4.9 compares how women and men use the income from irrigated production.

Table 4.9. Use of irrigated crop production, male and female plots in kg

	Male plots	Female plots
Sold	4120	4560
Household consumption	1360	800
Cooperative fees	920	760
Gifts to parents	-	520
Other gifts	160	320
Total production	6720	6800

Source: field data, Dakiri

Table 4.10. Use of the income of irrigated plots

Use, in order of priority	Male plots	Female plots
1	Millet	Millet
2	Animals	Spices, fuelwood
3	Clothes	Animals
4	Cash reserve	Clothes
5	Meat or fish	Cash reserve

Source: field data, Dakiri

All female plot-holders, as well as their husbands, were unanimous about their increase in the contribution to household supplies after having obtained an irrigated plot. Female plot-holders were very proud about their increased ability to contribute to the household's needs: *"Before I got my irrigated plot, I could not contribute much to the household, because if you do not have anything, you cannot give anything, you cannot help someone else. Today, my contribution is much more important. If I sell paddy, I can buy animals. If there is food scarcity, I sell some of my animals to buy millet."* And another, *"I contribute much more to the household since I have my irrigated plot. Any kind of problem that occurs in the family, I can help to solve, which was not the case earlier. My husband has his own plot; I do not give him anything. Now, all my children have at least three sets of clothes. If my brothers or sisters have a problem, I help them."* The ability to significantly contribute to household survival also increased a woman's status within her household and within the community. Also, a man's appreciation of a woman was very much a function of her agricultural performance.

It was primarily their greater ability to contribute to household supplies which accounted for female plot-holders' happiness with their plots. The reason why women preferred to contribute to the household's survival by contributing produce from their own plots, rather than by providing labor to the plots of their husband was that cultivating their own plots made them less dependent economically on their husbands. The fact that they themselves controlled the income was equally important, not so much as a sign of independence or autonomy, but primarily because it allowed women to use part of the income to support their own kin (their parents, brothers and sisters). It also increased their opportunities for individual accumulation of wealth in the form of livestock. In fact, a comparison between female plot-holders and women without plots revealed that plot-holders had on average 3 to 4 goats or sheep and 1 cow, while non-plot-holders only had 1 to 2 goats or sheep and no cows.

The four effects of having an individual plot (e.g. ability to contribute to household survival, economic independence, ability to support kin and individual wealth accumulation) together improved the bargaining position of a woman within a household. Economic independence, wealth accumulation and supporting of kin together strengthened her fall-back position: if for whatever reason she had to leave her husband (or if he leaves her), she would be able to support herself at least for some time.

Conclusions

Just as earlier gender and irrigation studies, the Dakiri study showed that women are more willing to contribute labor to irrigated production when they are sure to benefit from the harvest. Chances of this are higher when women have their own plots. When the Dakiri case study was first published some ten years ago, its conclusions were very much written in view of an irrigation audience, with its own preoccupations with performance and productivity, and clearly aimed at convincing this audience of the benefits of granting women their own irrigated plots. These conclusions read as follows:

“The findings of the study show that the productivity of both irrigated land and labor is higher in households where both women and men have an irrigated plot each, in comparison with households in which only men have plots. Women are equally good as men or even better in irrigated farming, while their motivation to invest labor in irrigated production significantly increases when they have individual plots. Income of women increases sharply when they have their own irrigated plots, while the proportion of labor contributed by women to men’s plots is virtually the same. The increase in income obtained by having irrigated plots reduces women’s economic dependence on men, and strengthens their bargaining position within the household.

It is important to recognize that, in Dakiri, households where both men and women have plots have more irrigated land than households where only men have plots. The labor contribution (person-days per hectare) therefore decreases when there is more than one plot-holder per household. The evidence nevertheless suggests that allocating smaller plots separately to men and women, instead of allocating bigger plots to household heads, has positive production and social benefits.” (Zwarteveen, 1996:13)

Ten years later, I find it somewhat worrying that the study is mostly cited to spread the message that women can produce as much as men. This was not what I intended to convey, nor what I believed the main message of the study to be. Apparently, the idea that women are well performing farmers is still (deemed to be) an important argument needed to convince policymakers and donors of the fact that they should channel resources to female farmers (as well). I do understand that the idea that women are well-performing producers is a message the neat simplicity of which appeals to those whose choices are primarily guided by returns to investments and productivity figures. Yet, I am concerned about the simplification it entails. On the face of it, seeing and addressing women as active and capable farmers is an enormous gain as compared to their earlier portrayal as merely mothers, housewives and laborers on family fields. It grants them agency and recognizes their economic and productive worth. Yet, with the emphasis on their productive roles, their positioning in households, communities and lineages tends to disappear into the background. It also continues to conceptually separate the irrigation system from its social environment. In addition, seeing them as farmers in their own right

leads to a methodological individualism that matches dangerously well with current neo-liberal economic policy language, but that risks reducing gender to just another 'market distortion' or 'comparative disadvantage', entirely disassociated from social relations and power.²¹ Such reductions and disassociations make it difficult if not impossible to reflect about (and act on) gender equity or feminism. Attention to women is justified because of their productivity, and not because they are exploited or because gender relations are unjust or unequal.

In the rest of this concluding section, I discuss some of the implications of the study findings for recognizing women and gender in irrigation thinking. I do this by comparing and contrasting this chapters' construction of the irrigation reality of Dakiri with those produced by more mainstream irrigation studies (such as for instance the IIMI reports that were produced at the time). This comparison reveals important discrepancies and differences between the two accounts of irrigation realities, which provide possible entry-points for answering the larger question of this thesis about how to think about and conceptualize irrigation realities in ways that enable recognition of gender as constitutive of such realities. In particular, it enables the identification of three important themes that do not normally belong to what is thought of as requiring explanations in irrigation thinking, but that are instead taken for granted or implied. Yet, these themes are precisely the ones that are at the center of what needs questioning from a feminist perspective. These are (1) households; (2) property rights and tenure systems (3) development or progress.

Nuclear households or individual farmers?

At the root of differences in interpreting irrigation realities lay different definitions and conceptualizations of a household. In most conventional irrigation writings, farmers are referred to as individuals, and households tend to be conceptually modeled on an ideal-type nuclear household that is characterized by a sharing of resources, labor and incomes. The IIMI reports about the Dakiri system also reflected this tendency, for instance in calculating returns to labor investments in irrigated agriculture by simply assuming that all household members would contribute all their labor to the production of irrigated crops (see Abernethy, 1994). Likewise, objectives of irrigation investments were defined (as social or economic, respectively) depending on whether or not the plots were adequate to sustain "full-time, normally remunerated occupation for the user and active family members and/or provide income for family self-sufficiency in food plus some surplus" (PMI-BF/IIMI, 1993). The findings of the study as presented in this chapter pose some important challenges to the wisdom of this nuclear household assumption.

For one, they prompt questioning how incomes earned, or food produced, by the plot-holder will be used, and who will benefit from it. The information about Dakiri showed that this question is not answerable in a very straightforward and direct

21 See for instance Palmer, 1991.

way, because it depends not just on the gender of the plot-holder but also on the designation of the plot and, most importantly, on the webs of social relations to which the plot-holder belongs. Does she have children to feed, and how many? Does he have parents to support? Does she share important domestic tasks with co-wives? Secondly, these challenges demand further inquiries into how resources and labor are mobilized and shared within households, which is – at least for the Dakiri case – an equally complex question to answer. There are some guiding principles defining the responsibilities and duties of the different household members, but these are negotiable and contested. They also vary depending on how much household members contribute to the survival of the household from their own production. Responsibilities and duties extend beyond narrow household boundaries. Young men for instance may be required to work in the fields and plots of their future parents-in-law, and women who are just married may be expected to continue working for as long as they do not have children on the fields of their father. Where women feel the responsibility to help their parents (and brothers and sisters), married men often continue to feel that their households ‘belong’ as it were to a larger household that consists of their brothers with their wives and children together with their parents. Third, the Dakiri case shows that what one refers to when using the word household is ambiguous. It may refer to a kitchen unit or hearth-hold (consisting of a woman and her dependents), or to a ‘nuclear family’ consisting of a married couple with children, or to several women-headed hearth-holds with one husband, or again it may refer to a ‘large household’ consisting of an older man with his wives, their married sons with their wives, and their children. The very definition and boundaries of a household, including the question of who belongs to it, are in fact likely to be among the issues that become contested when there are disputes over the allocation of labor, resources and incomes.

These challenges are not at all new. Similar challenges as these have been articulated in many studies and articles, and have fuelled debates and discussions about how to best conceptualize the household and intra-household relations. One alternative to the nuclear household assumption that is sometimes proposed and used in studies and policy documents is the treatment of male and female farmers as individual producers, analyzing differences between the two categories as rooted in gendered differences in access to resources, information and labor (see for instance Quisumbing, 1996). One advantage of this is that it allows the recognition ‘that women are different, yet equal’. Yet, a replacement of the nuclear household with a conceptualization of men and women as individual farmers in their own right is not a big improvement in terms of understanding the dynamics of irrigated production. The fact that there exist clearly identifiable female and male domains of activity that are relatively independent of each other, and the fact that there are realms where women have significant power of decision should not be taken to imply or construct complete independence of women from men (or vice versa). Spouses do cooperate, even when incomes are kept separate. Indeed, cooperation and sharing as captured in intricate webs of mutual responsibilities are important characteristics of the social

fabric of Dakiri society, and importantly shape people's motivations for farming behavior. As a result, what women and men do cannot be understood in isolation, because their activities and behavior are interrelated and mutually influence each other. A change in the activities and incomes of men will lead to concomitant changes in the activities and incomes of women, and vice-versa. Gender can likewise not be prioritized over other social relations in shaping resource allocation decisions. Gender is not the only axis around which property and labor relations are organized. Gender 'colors' all kinship and marital relations, and is one important determinant of one's position within such relations. Yet, one's responsibilities and rights within households and larger lineage networks are also determined by for instance how many children one needs to feed or by how many co-wives one has. The corollary of this is that not all women share the same interest and needs with respect to irrigation or irrigated agriculture, making distinction of a specific female interest group empirically difficult and politically meaningless.

In search for a more appropriate household concept, I think Ekejiuba's proposal for a conceptualization based on nested hearth-holds maybe a useful start. The hearth-hold is the unit demographically made up of a woman and all her dependents whose food security she is either fully or partially responsible for. The male spouse can be either a full member of the hearth-hold, but he can also oscillate between several hearth-holds. "The hearth-hold is primarily a unit of consumption and also a unit of production. Its function as a reproductive and socializing unit usually depends in part on transfers from other hearth-holds or households. It is not necessarily a co-residential unit since members may temporarily reside in places other than occupied by other hearth-hold members." (Ekejiuba, 1995:51). Hearth-holds are nested within households, and within wider lineage and kinship networks. Economic and social links between heart-holds within a household, between heads of heart-holds and heads of households, and between heart-holds and wider lineages are marked by solidarity and conflict. When trying to understand the determinants of irrigation performance, or responses to the introduction of irrigation, departing from hearth-hold units instead of household-units may thus be a significant improvement. In practice, this would mean that calculations about labor investments, food production and security and about incomes are linked to women's economies, with the realization that these are often part of larger household and kinship exchange networks.

In any case, what a household *is*, and how it functions, is a question that needs to occupy a prominent place in feminist irrigation thinking. Rather than simply making assumptions about labor availability on the basis of simplistic and normative household models, people's motivations for behavior and for investing time and resources in different activities need to be empirically verified. It is important to realize that the household is one important domain in which such motivations are shaped and negotiated, and also that this is a highly gendered domain.

Household or individual plots?

The difficulty to conceptualize and make sense of households also complicates and confuses questions about tenure relations and plot ownership. The different IIMI studies about irrigation in Burkina Faso agreed that tenure relations were complex and needed clarification. One mid-term report concluded for instance that "Land tenure is in a phase of transition, between on the one hand a system of collective utilization in which the benefits are controlled and distributed by the traditional authorities, and on the other an individual system in which title to land is controlled and distributed by the public authorities." (PMI-BF/IIMI, 1993). What underlies such recommendations, and on which also many more recent irrigation studies about Africa are based, is an evolutionary theory of land rights. A central tenet of this theory is that under the joint impact of increasing population pressure and market integration, land rights spontaneously evolve towards rising individualization and that this evolution eventually leads rightholders to press for the creation of duly formalized property rights – a demand to which the state will have an incentive to respond (see Platteau, 1996 for an elaboration). Clear policy implications of this theory, and one that is repeated in many irrigation documents, is that the state needs to implement a land titling program aimed at formalizing private property rights in land once it has become so scarce as to make it a source of acute competition (Platteau, 1996:30). A key assumption on which this recommendation is based is that privatization will lead to higher agricultural outputs, and thereby help improving returns to, or justifying, irrigation investments.

The Dakiri study does not support existence of such a situation of legal pluralism. In day-to-day realities, the distribution of rain-fed fields as well as that of irrigated plots continues to happen largely through traditional networks and authorities, many of which are kinship-based. More importantly, the more or less clear distinction between 'individually owned, privatized plots' that are deemed typical of modern tenure systems, and 'collective or communally owned' plots that are associated with tradition fails to capture much of the complexity and specificity of the intricate sets of obligations and rights in which forms of land access and tenure are embedded. In Dakiri, individual tenures can be said to exist under a general system of corporate ownership and there are communal arrangements that consist of multi-tenure systems with different land-uses calling for different tenures. Indeed, and in line with what I proposed as a conceptualization of water rights in chapter 2, land rights closely embedded in wider sets of social relations of power and embody traditions, identities and culture.

Insights similar to those of the Dakiri study have been used to seriously question the wisdom of tenure reforms in the direction of more privatized property regimes, both on account of the anticipated increases in efficiency and productivity as on account of the likely dangers of dispossession of large groups of people that such reforms entail (See Alden Wiley, 2001; Lastarria-Cornhiel, 1997; Platteau, 1996). They also call into question the simple gender strategy of allocating newly irrigable plots just to women as a way of realizing their empowerment. For the case of the Dakiri

study, the analysis suggested that irrespective of whether women control plots or not, some balance (although not necessarily an equitable or just one) between the contributions of male and female household members eventually will evolve, in which higher earnings by either men or women will be, as it were, compensated by an obligation to also increase the contributions to household survival. Rights such as those of access to and use of an irrigated plot do not 'work' in isolation, but will typically go accompanied with other rights and duties, such as the right to a share of the harvest of the collective millet field controlled by the husband, the obligation to spend the harvest of the plot on specified goods, and the obligation to provide labor to the collective millet fields. What this means has been documented in many studies, all suggesting that increases in the productivity of plots owned by women go accompanied with increases in women's responsibility to contribute to the household food provision, and thus with a reduction in men's responsibilities to provide food (See Jones, 1986; Carney, 1998; Dey, 1982 and World Bank, 1995:37).

In all, such insights and evidence raise important questions about the meaning of rights and the importance of private tenure, about the validity of simplistic distinctions between collective and individual rights, and about the linkages between women's rights to land and their empowerment. For irrigation conceptualizations to allow the recognition of gender as constitutive, such questions need to be central.

Progress, development, empowerment?

In a different way, the questions raised above also prompt a rethinking of the populist feminist ideal of individual autonomy based on economic or financial self-sufficiency, an ideal that finds resonance in neo-liberal irrigation policy proposals that promote the idea of women as rational entrepreneurs. The already referred to importance of sharing, and the existence of intricate webs of dependencies and mutual responsibilities that are tied to social respect and identity, make the ideal of autonomy one that is far from the reality of Dakiri men and women. Instead of autonomy, I think it is possible to assume that most Dakiri women would opt for a development strategy that consists of maintenance of, and investments in, conjugal and kinship ties. Among other things, these permit access to the wider web of non-conjugal support that each partner's ties of kinship, friendship and clientage weave (O' Laughlin, 1995:76). The household and intra-household dependencies, can therefore not simply be pointed at as the main cause of gendered inequities, but are also important ingredients of power and strength for women. The implication is that the strategy for women's liberation or empowerment does not unequivocally lies in increasing women's financial and economic independence, but instead also consists in the search for ways to strengthen intra-household and kinship ties of solidarity and mutual help that lie at the basis of livelihood strategies and food security. And it may also lie in making sure that the new possibilities for accumulating individual

surpluses are not concentrated with just some people, but are more or less fairly distributed.

Ideas about autonomy as a feminist ideal are linked to the frequent reference to rural women's activities *inside* and *outside* the household. In western industrial societies (the cradle of much feminist thinking), work within the household was traditionally restricted to 'housekeeping' and childcare, reflective of the household's function as a unit of consumption and reproduction. *Productive* work took place outside the home, both physically and organizationally. Such production was mediated by the market. These distinctions between *inside* and *outside*, between *domestic* and *productive* are not very helpful to describe African farm households (and probably also not for many farm households elsewhere in the world, see Zwarteveen and Endevel, 1995), since domestic residences most often combine units of production with units of consumption and reproduction. Yet, they underlie ideas that women's liberation and emancipation consists of their move outside of the household, and into the spheres of productive work.

They also underlie the idea that a main source of gender injustice lies *within* households, and more precisely in conservative traditions and social customs. How to judge the Dakiri situation in terms of gender equity is, however, not so self-evident. In Dakiri, although women did have clearly defined degrees of freedom (freedom to divorce, relative freedom to control the production of their own fields, freedom to accumulate their own wealth etc.), the society also displayed clear characteristics of 'patriarchy' in its patrilineal inheritance and in the fact that women, upon marriage, were to live with the family of their husbands. At the same time, also men had clear responsibilities, and both men and women had the means and power to require compliance to respective responsibilities from the other. Women could divorce their husbands and either return to their maternal homes, or re-marry with a man whom would better fulfill his duties towards her and her children. A clear source of bargaining power of women also lay in reducing or increasing the amount of days they agreed to work on the collective fields.

The study showed that the introduction of irrigation has not so much caused a rupture or break with existing ways of organizing labor and dividing incomes. Rather, irrigated agriculture was, more or less smoothly, incorporated in existing ways of farming. What is very clear is that the designation of irrigated plots as either collective or individual makes a difference, both in terms of labor allocated to the cultivation of the crops as well as in terms of how the proceeds of the plots are divided. Women's access to irrigated plots clearly has positive effects on their bargaining power and fall-back position within households, especially when such plots are considered as their individual plots. Whether these benefits will translate in longer-term improvements in gender equity remains a question. For one, most irrigated plots (also those owned by women) are likely to be inherited by sons. If the plots allow women to accumulate some savings, their daughters will benefit.

In all, it is clear that the changes that occurred through the introduction of irrigation cannot be explained by simple models of evolutionary change,

straightforward transformations of the culturally defined divisions of labor or unambiguous linear trends (rise or fall) in female status (Guyer, 1995). Indeed, the very question what progress (development, empowerment of women) consists of is one that requires a central place in irrigation conceptualizations.

Free-riders or victims? Gender and irrigation in Nepal.

We know that women are almost always heavily involved in the agricultural activities associated with irrigation. Yet, we do not see much direct women's participation in managing the water, structures and processes whereby agriculture is made more productive through irrigation. (Uphoff, 1986)

This chapter presents a case study of a farmer managed irrigation system in Nepal, the Chhattis Mauja. This study was done to explore the implications of the discrepancy between women's high involvement in the field tasks of irrigation and irrigated agriculture and their low participation in the system's management. The findings of the study are contrasted to conventional irrigation wisdoms about the functioning of water users' organizations on the one hand, and to populist feminist wisdoms about the desirability of 'including' women in decision making on the other. This contrasting of (my construction of) the 'first' irrigation world to the 'second' irrigation world reveals a number of inconsistencies and discrepancies that I use as entry-points for further reflection about ways to think about irrigation that grant women a legitimate existence, and that accept gender as constitutive.

Just as the study presented in the previous chapter, the case presented here belonged to some of the first that were done at IIMI about gender relations. When embarking on the study, I was hoping that it would produce win-win type recommendations such as: Empowerment of women through increasing their participation in the irrigation organization is good for women, while it will also boost irrigation performance. And I also hoped that through such recommendations the study would provide evidence to show that women and gender matter for thinking and acting on irrigation. I wanted and needed such evidence, not just to justify and protect my own professional interests, status and identity but also to help establishing gender as a topic of legitimate concern for irrigation professionals and researchers.

The concern of the study was the lack of responsiveness of the Chhattis Mauja users' organization to the water needs of women, caused by their non-involvement in this organization. The hypothesis was that because of their absence from the organization, women would have weaker possibilities to voice their water concerns and opinions than men. As a consequence, their access to water would also be worse

than that of men. This hypothesis was formulated on the basis of some earlier studies that were done in Nepal about gender and irrigation, which showed the importance of women's labor for irrigation and irrigated agriculture and the lack of reward and recognition of this importance at different levels of management and policy-making. This, as the studies claimed, made it difficult for women to defend their water interests and to obtain the water they needed at the time and place required. The studies thus linked membership and participation in resource management organizations to access to and control over natural resources. They suggested that women's relative lack of participation reflected and sustained wider gender disparities in property. The hypothesis was also informed by more general feminist thinking and policy-making, which associates inclusion in formal decision-making bodies with power. Such associations for instance lie at the basis of affirmative action strategies and quota systems aimed at increasing the numbers of women involved in public decision making. They also justify the use of female participation ratios in political decision making as both indicators and determinants of emancipation or 'women's status'.

The choice for Chhattis Mauja as the location of the study was importantly inspired by the fact that the system was an almost paradigmatic example of successful farmer management of irrigation. The Chhattis Mauja had provided an important case on which theories about the determinants of the performance of water user organizations were built. Uphoff, while theorizing about local water management, for instance claims that "one of the most important case-studies which demonstrated that farmer management could be effective for large systems and sustained over many decades was (...) on the Chhattis Mauja scheme in Nepal" (Uphoff, 2002:33). In his seminal review of 50 cases of farmer participation in irrigation, the Chhattis Mauja figured prominently as a remarkable example of what farmers could do on their own, without outside support (Uphoff, 1986). Together, the findings of the different studies¹ form an orchestra of praise and admiration for the achievements of the Chhattis Mauja irrigators, achievements that were realized without any external financial or technical support. Most of the studies attribute this success (at least partly) to the fact that *all users* are involved in the management of the system. When looking from a gender perspective this is a puzzling finding, because such a perspective reveals that *all users* means (some) men, and that many of those who are actually applying the water to crops are not among those making decisions. Have previous performance assessments overrated the success of the system? Or does theorizing about user management require revision, and is it not

1 The frequent visits of researchers to the Chhattis Mauja even led to a decision by the scheme's management to levy fees to outsiders wanting information about the system. These fees were included in the list of income sources in the constitution. Among the writings about Chhattis Mauja are Pradhan, 1983 and 1989 and Yoder, 1994a. Studies that also looked at the Chhattis Mauja include Shrestha and Kumar Sharma, 1987; Moench et al., 2003 and Gautam, 2005.

necessary that *all users* are involved for realizing high performance levels? Who are (to be) considered users, and do women belong to this group?²

In what follows, I first briefly provide some further background to how FMIS have figured in theorizing about irrigation. I do this on the basis of a brief review of thinking about Farmer Managed Irrigation Systems (FMIS) which explains how different thinkers see in FMIS the proof that an alternative irrigation management model is viable and possible. The review also helps explain why gender concerns have remained rather marginal and inconsequential in FMIS studies. After the review, I present a description and analysis of gender and irrigation management in the Chhattis Mauja based on the case study. Most of the field work for the case study was done during the paddy growing season (between June and December) of 1993. The data presented here were collected through participant observation and repeated in-depth interviews with a small number of household members in two head-end villages in the Chhattis Mauja scheme, Shankar Nagar Tola and Naya Chaparrhati. These were both villages with a relatively large number of de facto female-headed farms, because many men were involved (or had been involved) in off-farm employment. Some men for instance (had) worked in the British or Indian army, and had bought the land with the money thus earned (also see annex 1 for more details about the research methodology). Although the field study covered villages in all sections of the irrigation system, here I focus only on the head-end villages, which are also the ones with best access to irrigation water, with highest cropping intensities and with smallest average landholdings (as compared to those in the rest of the scheme). Due to their hill origins, many people in the head-end also were of a different ethnic identity (Maghar) than the original inhabitants of the Chhattis Mauja area, who were Tharu.³

The focus on the head-end allows an in-depth analysis of the discrepancy between women's high involvement in agriculture and their lack of participation in the system's management. I use the information collected to systematically establish gendered participation in agriculture and management and to explore the consequences of women's non-involvement in the organization in terms of how their irrigation needs are met. In the last concluding section, I use the case study findings to revisit the two established wisdoms referred to above: the attribution of high irrigation performance levels to the involvement of users in its management, and the

2 Results of the study have been published earlier in the *Asia-Pacific Journal of Rural Development* (Zwarteveen and Neupane, 1995) and as an IIMI research report (Zwarteveen and Neupane, 1996).

3 Tharu women are believed to be less involved in agricultural field activities than hill women. During the study some Tharu men even remarked: "If our women worked as hard as the hill migrant women, then we would also be as prosperous as they are". Tharu women were also less involved in irrigation; only female heads of farms irrigated. When asking Tharu women about their irrigating tasks, they would sometimes answer in the form of a shrug as if to say, "How do you expect women to do this?" Yet, Tharu women are also generally less outgoing, and less inclined to talk at length about their work and achievements. The observations of Suman Gautam, who did research in the same area suggest that, unlike what the above statements suggest, Tharu women work as much as hill migrant women (Gautam, pers. com., 2005; Gautam, 2005).

linking of inclusion and participation with power. This exercise provides further ingredients to reflect on ways of representing irrigation realities that allow seeing and questioning gender.

FMIS: Alternative (irrigation) development?

In this section, I review and discuss the FMIS literature with a focus on how it inspired thinking and theorizing about community institutions for natural resources management. To assess how and whether such thinking allows visualizing and understanding gender, I dedicate special attention to their treatment of social differences and social equity.

The ingenuity of farmers

As was already briefly mentioned in chapter 3, increased attention to FMIS (or communal systems) in the 1980s and 1990s happened almost simultaneously with – and maybe a result of – the entry of more social scientists (sociologists and anthropologists) into the professional irrigation world. Although management of canals by local communities had always existed and received some attention in the irrigation literature (see Coward and Levine, 1986), existing or ‘traditional’ management systems had tended to be categorized as inferior to ‘modern’ systems, and as in need of modernization and civilization efforts led by western trained engineers. FMIS studies done in the 1980s partly served the purpose of challenging such associations of ‘traditional’ with ‘backward’ by emphasizing the abilities, intelligence and ingenuity of irrigators’ communities. Much of this early FMIS literature conveyed a sense of admiration about what farmers’ and irrigators’ communities could achieve by themselves, without any external support and without any access to modern knowledge or technologies. Uphoff, to give just one illustration, for instance wrote “farmers not only have social skills for problem-solving but also valuable technical knowledge about acquiring and controlling water” (Uphoff, 1986:25).

In a broader sense, FMIS experiences served to critically question the prevailing modernization paradigm on which most irrigation development interventions were based (cf. Mosse, 1999:321), as well as the role of the state and external donor assistance in developing and managing irrigation systems. In particular, thinking about the role of community in modern societies was revisited by FMIS studies (cf. Agrawal and Gibson, 1999, 2001). Irrigation professionals belonging to a modernization tradition held the belief that development (and societal evolution) implied a move from relationships based on status, kin networks and joint property to those based on contract, territory and individual rights. Community, in this view, was to be replaced by other (more modern) forms of social organization. Many of the early writings on FMIS, in contrast, presented an alternative interpretation of what

development was about. FMIS studies projected a much more positive view of customs and traditions, and of social relations based on kinship and reciprocity. Instead of positing the unavoidability of their disappearance for the sake of development, these studies suggested that development needed to be anchored in, and build on, such local forms of social interaction and organization. Community, in many FMIS studies, was thus evaluated positively, tying humans to their social and physical environment and providing a sense of selfhood and belonging.

In the wider scholarly debate, there was doubt about whether (capitalist) development and modernization were compatible with the continued existence of communities. Most irrigation writings, however, were more pragmatic and searched for ways to combine the conservation of community organizations with new irrigation investments and developments (cf. Coward and Levine, 1986). Knowledge of FMIS was seen as useful for achieving a better 'fit' between those irrigation systems and organizations that were designed by experts, and local realities. Projects and systems needed to be (made) appropriate for the local situation – and, as a consequence, designs needed to be adapted to local circumstances (see Diemers and Slabbers, 1992; Horst, 2001; Coward and Levine, 1986). Coward and Levine for instance suggested – based on a review of literature on local irrigation systems – that the study of the underlying logic and fundamental values on which operational choices in farmer managed systems are based is important. These are “likely to be in strong contrast with the implicit cultural ideas of the technocratic irrigation department” (Coward and Levine, 1986:33). They concluded: “our understanding of the outcome of public interventions in farmer-managed systems may be enhanced if we operate from a sound cultural analysis of the farmer-managed systems (as well as the implementing agencies) and anticipate project outcomes that reflect local cultural accommodations” (Coward and Levine, 1986:33).

Are communal systems more equal?

In line with a positive view of community as a worthwhile repository of tradition and customs, attention to FMIS was inspired by the idea that 'community' forms of organizing water distribution were more just and socially equal than bureaucratic forms of management. Although rarely explicitly spelled out, the association of FMIS with equity was based on two assumptions. The first assumption is based on the common property nature of FMIS, and says that chances of fairness in access to and sharing the benefits of the use of a resource are greatest when it is managed under a common property regime.⁴ This assumption is related to the fact that many people share (the use of) a resource, and to the (belief in the) existence of traditional community values of solidarity, co-operation and interdependence. While in the past concerns about the “tragedy of the commons”, which (following the analysis of Hardin, 1968) had led to recommendations favoring the abolition of common

4 The reasoning is that private property is more efficient and common property more just. Baland and Platteau, 1996:36-46 provide a review and discussion of this reasoning.

property, FMIS studies fuelled a renewed belief in the existence and importance of cooperative behavior among individuals in using and managing natural resources. Unlike Hardin's predictions, users of common property resources could be shown to not just be selfishly interested in the short-term benefits of resource use, but to be also concerned with more altruistic long-term considerations of conservation and sustenance. The second assumption underlying the belief in the greater equity of community forms of management sees these as more democratic than bureaucratic forms. For Uphoff for instance, a main reason to have participatory irrigation management was that: "...there is a growing democratic spirit in the world that does not purely accept bureaucratic management or unaccountable political decision making" (Uphoff, 2002:35). The idea is that user involvement allows users (irrigators, farmers) to have a voice in how to use resources and in how to liaise with state agencies. This idea has inspired (and continues to do so) NGOs working on bottom-up irrigation initiatives with explicit empowerment objectives.

Interestingly, where most other scholars do not mention gender, some feminist and gender scholars adopt a similar reasoning to argue that chances of gender equity are higher when natural resources are managed under a common or public property regime, as compared to private property regimes. They base this argument mostly on evidence from forestry. Their story is more or less as follows: although in most societies gender is and has always been one of the structuring principles in determining inheritance and ownership rights of property, women were not always or automatically the ones without (or with least) access. In the pre-colonial and early colonial period, many natural resources were not in the hands of individuals or households, and availability of use to members of communities was arranged through a complex variety of customary rights and arrangements (Agarwal, 1994; Rocheleau and Edmunds, 1997; Lastarria-Cornhiel, 1997). The common or public nature of these resources implied that women usually had some form of access to them. Hence, even where women did not hold private ownership rights of resources, they still could rely on some form of access to them. Such access has nevertheless gradually diminished because of processes of statization and privatization (cf. Agarwal, 1994; 1997b; Lastarria-Cornhiel, 1997), processes biased in favor of men.⁵

Although equity considerations were frequently mentioned as an argument in favor of more user participation in management, such mention was rarely backed up with empirical evidence other than with figures showing that all plots in a designated command area received a proportionally equal amount of water – which is the conventional irrigation equity measure.⁶ The few more sophisticated attempts

5 This reasoning echoes broader ideas in non-governmental and environmentalist circles that base models for present development on the ideal sustainable and socially just relationships between communities and their environment that had (presumably) existed in the past (see Agarwal and Narain, 1989).

6 One of the few more detailed attempts to link equity to management is that by Mabry and Cleveland who compared data of many systems to conclude that traditional community managed

to think about equity generally agreed that notions of fairness and equity are better articulated and play a more important role in FMIS than in government managed systems. Rather than emphasizing that that these systems are fairer or more equal when judged with some 'outside' definition of equity, these writings suggest that fairness and equity are among the topics that clearly figure on the agendas of local water decision makers (Levine and Coward 1989:17; Boelens and Dávila, 1998:131). There exist many other studies that relate (some form) of equity to irrigation management performance, but these are not concerned with the question of how to support, sustain or foster equitable forms of management. Instead, they ask the reverse question: is it possible to have well performing systems in societies that are socially differentiated and stratified?⁷ Some authors argue that good management performance is more likely in relatively egalitarian communities (Tang, 1992; Jarayaman, 1981), others argue instead that some degree of inequality is positive or necessary to resource regulation and management (Ostrom, 1990:83; Quiggin, 1993:4). Wade, in his various writings, repeatedly attributes the good performance of community organizations to the fact that their leaders are drawn from the elite, wealthier people who have the authority to make decisions because of their power and prestige. He claims: "Corporate organizations to be effective should be based on existing structures of authority. In practice this means that the council will be dominated by the local elite, which is a disturbing conclusion for democrats and egalitarians. But rules by the majority of the village would carry little legitimacy in the eyes of the powerful" (Wade, 1987:230). Baland and Platteau, in a more general discussion about community management of natural resources, conclude: "When economic inequality does not thus prevent uniformity of interest in a collective agreement it can even be a favorable factor if the rich can assume leadership roles (Baland and Platteau, 1996:307).

Rather than fairness or equity, the reasons more often used to justify research and donor investments to FMIS had to do with the intensification of irrigation and with attempts at making irrigation systems more efficient and effective.⁸ The promotion of more participatory forms of irrigation management based on examples of FMIS was for instance often based on the argument that FMIS performed better than agency-managed systems.⁹ Better performance was primarily attributed to the fact that users in FMIS are more interdependent: they need each others' labor for the

agriculture tends to be more equitable than modern 'industrial' agriculture (Mabry and Cleveland, 1996).

7 Also see Wegerich, 2005:72-75 for a review and discussion of the literature on the linkages between social hierarchies and the performance of resource management institutions.

8 In the margins of more mainstream irrigation approaches, there are nevertheless many people who were and are concerned about questions of equity, justice and fairness in irrigation. There are many professionals, mainly from NGO or activist backgrounds, who believe in participation as a way towards (partly) reducing social difference and who find support for this belief in evidence from FMIS.

9 Lam (1994) for instance provides a statistical comparison between the performance of FMIS and agency-managed systems in Nepal. See also Joshi et al., 2000; and Ostrom, 2002.

maintenance of the system. This is not (or less) the case in agency-managed systems, which generally have 'modern' headworks and lined canals that require less maintenance and less labor.

Institutions for irrigation systems

FMIS studies have in fact been, and continue to be, important in feeding the strong belief in the importance of local institutions for irrigation management. They have served as an important source of inspiration for theorizing about the principles, conditions or rules that characterize successful irrigation institutions (Ostrom, 1990; Bromley, 1992; Wade, 1987). In the neo-liberal age, FMIS studies – and the proof of the autonomy and self-organizing capacities of communities they embodied – have also become important ammunition in favor of the transfer of irrigation management responsibilities from states to users.¹⁰ In this stream of literature, FMIS are again primarily associated with the greater ability and capacity of users to manage irrigation systems efficiently and effectively, as compared to state agencies. Important, too, in times of austerity and downsizing of public budgets, is the fact that FMIS in general draw on few public resources for their creation and, to a large extent, are self-supporting in their continued operation.

The professional and academic attention to institutions was and is very much driven by an urge to find the 'ideal' or 'true' organization, by the idea that there is some secret to successful institutions that can and should be uncovered. It guided many studies that were done in Nepal and elsewhere in search of the underlying determinants of institutional performance of FMIS. The comparative study of Pradhan of 21 systems is an early example, which was still of a rather descriptive and taxonomic nature. In contrast to later work, this study emphasized the diversity and embeddedness of FMIS in local cultures and ecologies (Pradhan, 1989). Another example is the study by Robert Yoder, a comparative analysis of FMIS done with the objective to "identify relevant experiences and lessons for staff who are responsible for working with locally managed systems" (Yoder, 1994b:6). This study concludes with a list of characteristics of successful locally managed systems. The fact that full authority is vested with system members is identified as one important characteristic, because it allows the organization to modify its rules and adapt its procedures to changing conditions (Yoder, 1994b:83). And, interestingly, what is also identified as an important success factor is that "virtually all irrigators have a voice in making decisions" (Yoder, 1994b:83). The direct involvement of users, the fact that they know each other and make decisions collectively, the open atmosphere of sharing information are among the key ingredients of successful local management (Yoder, 1994b:83-85). The seminal work of Elinor Ostrom captures much theorizing about institutions based on FMIS work. Her eight design principles neatly

¹⁰ For Nepal, the title of a study by Robert Yoder: "Locally Managed Irrigation Systems. Essential Tasks and Implications for Assistance, Management Transfer and Turnover Programs" speaks for itself in this regard (Yoder, 1994b).

summarize the body of work that was geared at unraveling the determinants of self-organized resource management institutions (Ostrom, 1990).

And what about gender?

In all, a review of writings on or referring to FMIS shows that in most of them FMIS figured either as points of leverage in debates about the appropriate locus of control (and (financial) responsibility) of irrigation management, or as sources for further theorizing about the functioning of institutions. FMIS studies came in handy to contest dominant narratives that favored either complete state control or privatization of irrigation, and those that emphasized technical solutions over social ones. Much early FMIS writing was aimed at convincing bureaucrats and engineers of the benefits of farmer participation. As a result, many tended to emphasize the positive aspects of FMIS and were less interested in uncovering internal problems of social differentiation and power within FMIS. As one of my former colleagues phrased it: "The struggle to get farmers on irrigation agendas is already difficult enough without having to deal with gender". This probably explains why few early FMIS studies mentioned gender. Uphoff in his review of 50 case studies of irrigation management, only found 4 direct references to women's participation in irrigation management. He concluded: "We know that women are almost always heavily involved in the agricultural activities associated with irrigation. Yet, we do not see much direct women's participation in managing the water, structures and processes whereby agriculture is made more productive through irrigation." (Uphoff, 1986:89).

What is striking is that most writings ultimately based their argumentation on some kind of dichotomy in which 'farmers', 'user organizations' or 'local irrigators' communities' were pitted against 'engineers', 'the state or development agencies' or 'the market'. FMIS often symbolized the better alternative, the 'good'. As a consequence, the source of difference and axis of analysis that tended to receive most attention was also that between 'farmers' (users, irrigators) and 'engineers' (or bureaucrats). Other sources of difference (including those based on gender) between farmers, or between engineers, became less significant and visible. The objective of much writings was identifying how farmers differed in their irrigation logic from engineers, rather than understanding the differences among farmers. Farmers, although implicitly, often continued to be seen as men. In any case, they were individuals, and writings emphasized and isolated their irrigation roles from their other roles. As a result, gender or women became insignificant to the analysis: if users or irrigators were women, than they simply belonged to the same group of farmers that was already identified.

The Chhattis Mauja irrigation system

In this section, I introduce the Chhattis Mauja irrigation system. I start with a description of the irrigation system, briefly explaining its history and location. Gendered patterns of labor organization and involvement in different farming activities are largely a function of the importance of irrigated farming in household's livelihood strategies, which is why I continue this introduction with a description and categorization of different livelihood strategies of households in the studied head-end villages. In the next section, I use this categorization to provide details about the intra-household organization of agricultural production.

System description

The Chhattis Mauja irrigation system diverts water from the Tinau River at Butwal in the terai (plains) of Nepal. It is located in Rupandehi district, in the Western Development Region. The scheme was originally constructed by local landowners in the 1880s, who were mainly Tharus – the original inhabitants of the terai. The first main canal was built to irrigate Sagarhawa, a village at the tail-end of the system as it was in 1994. More recent and upstream settlements were promoted by the state and provided with support for expanding the pre-existing irrigation system. The translation of the name Chhattis Mauja itself, “the thirty-six revenue villages” suggests that they were formed due to the state's push, and not a spontaneous effort.

New settlements were organized through the grants of land titles: land lords collected revenues and forwarded an annual fixed sum to the state. Landlords were not so much private owners paying taxes, but functioned as representatives of the State entrusted with maintaining law and order, including assuring tax collection. From the late 1940s through the 1970s, migrants from the hills cleared the dense jungle and settled in the upper command area. The eradication of malaria in the 1960s and the completion of the Bhairawa-Pokhara and East-West highways increased migration. Floods and landslides also were reasons for some people from the hills to come to the Terai. Many of these migrants acquired land by encroachment, clearing a jungle plot for building a house and for subsistence cultivation. People thus settled could acquire irrigation water by paying a one-time fee to the Tharu canal leaders for permission to open an outlet to their villages. By 1958 the Tharu builders who had managed the system for the first 100 years were completely overruled by the hill settlers, and a three tier organization came into existence. The rules and roles for operation and maintenance evolved along the lines familiar to the immigrants from the hills, many of whom had previous experience with irrigation. A constitution that was first written in the 1950s underwent major revisions in 1979 and the rules being used were formalized. At the time of the study, the majority of the migrants in the Northern command areas (the present head-end) were from the hill districts, and most of them belonged to the Magar ethnic group,

while the majority of the farmers in the Southern area (the tail-end) were Tharus, the original inhabitants.

Diversion of water into the canal is accomplished by two temporary stone-and-brush structures (Kannya Dhunga and Ittabhond) on the alluvial fan at Butwal town. Because the fan is continually reshaped by floods, the temporary wing walls must frequently be modified and maintained. Farm household members in the command area contribute the necessary labor and resources for maintaining the scheme, in return for which they obtain the right to use irrigation water. The water diverted from the Kannya Dhunga intake flows from the North to the South. There are three distribution points in the canal (Sukha Nagar, Eastern Kalika Nagar and Western Kalika Nagar) before the water is re-diverted by the Ittabhond dam. Downstream of Ittabhond there are three more outlets after which the canal reaches Tara Prasad Bhond, the point where water is divided between Chhattis Mauja and Sorah Mauja. The Sorah Mauja canal irrigates those areas West of the main road, while the Chhattis Mauja irrigates the western part. At the time of the study, 54 villages were using water through 44 outlets and branch canals from the main canal. The gross command area was approximately 3,500 ha, serving 2,500 households and a total population of approximately 20,000. Most of the 44 outlets were temporary division structures with only wooden posts driven into the canal bed to define and control the width of the flow. About one third of the branch canals had, however, started installing masonry or gabion structures to better control the amount of water flowing into their branch.

Monsoon rice was the most important irrigated crop; during the monsoon season the whole command area was covered with rice. Wheat was the most important winter crop, but lentil and mustard were also grown in winter. At the time of the study, maize was partly replacing wheat because of its higher profitability. The only spring crop (which is only cultivated in the upper part of the command area) was maize (table 1).

Table 5.1. Possible cropping patterns in the Chhattis Mauja command area¹¹

Monsoon	Winter	Spring
Rice/lentil	Wheat	Maize
Early rice	Mustard and pea/gram	Maize
Rice/ lentil	Vegetables	Maize

Note: (/) = relay cropping. Source: field data, Chhattis Mauja

Farm households

The nature and degree of involvement in irrigated farming by male and female household members in Chhattis Mauja are very much a function of the importance

¹¹ Based on a survey of 128 households,

of irrigated farming in household's livelihood strategies. Taking the farm household members' own socioeconomic classification as a starting point, a broad typology can be made of three household categories: the rich, the middle class, and the poor.¹²

Rich households. Households in the rich category¹³ had access to 0.67 to 2 hectares of land, which, in combination with access to irrigation, was enough to meet the yearly food requirements of the family. In addition, in many rich households (56%), one or more male members earned some off-farm income or were receiving pensions. Many of these men had had high positions in the British or Indian army before settling in Chhattis Mauja. They purchased land in the command area of Chhattis Mauja with the money thus earned. These households' basic rationale for irrigated production was to grow enough food for the family. None of the rich households had to purchase rice although occasionally some bought some wheat for a change of taste. In addition, 67 percent of the rich households produced some crop surplus, which most of them sold to finance the following years' agricultural investments. Nonagricultural income earned by male members was both used for regular cash expenditures (clothes, electricity, school fees, etc.) and invested in off-farm enterprises, such as small shops or buses, or in livestock (67% of the rich households rear cattle of improved breeds).

An example of a rich household is a family with 20 members, 13 of whom are living together. Three sons are working in the army. The household owns 2.35 hectares of land. Rice, wheat, and maize are the major crops the family cultivates. Production from their farm is enough for family consumption, and the income earned by selling the surplus almost covers the expenses of next years' agricultural investments. The by-products of crops are used as fodder. The sons' army salaries and the pensions received by the father (who is retired from the army) have helped the family invest in two buses, which run from Bhairawa to Pokhara. Part of the money is also used in dhikuri, a sort of gambling. They have no intention of buying more land.

Middle-class households. Among the middle-class households¹⁴ were those who depended almost entirely on farming irrigated land for their livelihoods. Land, family labor, and irrigation water were the most important productive resources of these households. Landholdings in this category of households varied between 0.20 and 0.57 hectare. Of these households, 25 percent gained access to additional land through sharecropping.

For 56 percent of these households, their landholdings were large enough to meet the family's yearly food demand, and 10 percent produced a surplus, which was sold on the market. However, for most middle-class households selling

12 This typology is based on a wealth-ranking of all the households in Shankar Nagar Tola, one of the head-end villages, by the villagers themselves.

13 Of the village's 69 households, 20 percent were categorized as rich.

14 In the sample village, this group constitutes 45 percent of the total number of households.

surpluses, the income gained was not sufficient to meet their cash needs, and sometimes it was not even enough to purchase agricultural inputs and to pay labor costs. This explains why more than half the middle-class households needed regular access to off-farm incomes, most often through full- or part-time employment of male members. Some of these men worked as teachers, and others worked as rickshaw pullers or in private companies in nearby towns. Cash income was used to supplement the households' food requirement and to cover other necessities such as clothes and school fees. Income was also used to pay for agricultural inputs and to hire laborers. If anything remained it was invested in livestock.

A male member of a middle-class household records the expenses for cultivating his 0.67 hectare of land. He indicated that in the previous year his rice cultivation had cost Rs 7,625.¹⁵ He had to spend 27 percent of his annual salary just to cover those costs. In addition, he had to pay an annual fee of Rs 1,400 for using the Chhattis Mauja irrigation water because no one from his family was available to do maintenance work. He and his wife explained that if he were to lose his job, they would be forced to gradually sell off their land to meet their cash requirements.

Poor households. The category of households labeled as poor¹⁶ consisted of families who owned little or no land (landholdings varying between 0 and 0.34 ha.) and who had no stable off-farm income. Landholdings were too small to produce enough to meet the family's food requirements. For their livelihoods, the poor depended on a combination of sharecropping (57% of all poor households), hiring out their labor (70%), off-farm employment (8%), and irregular sources of income, such as the (illegal) collection of fuel wood and timber. Most often, the female household members were the one to work as agricultural wage laborers because demand for female wage labor was higher than for male wage labor.

One of the poor households survived through sharecropping for the last 23 years. The household consisted of five economically active members, and it owned no land. The family earned incomes through agricultural wage labor. Even though sharecropping was less profitable than working on others' farms for wages, the family preferred to sharecrop because it assured them of at least having access to a tangible quantity of food. In addition, the landowner provided them with a house, and they had access to loans through the landowner.

15 US\$1.00 = N Rs 47.50 (in 1994, the time of the study).

16 Thirty-five percent of the households were ranked as poor.

The intra-household organization of farming

This section explains how farming responsibilities were divided among household members of different categories of households. The section starts with a general description of the prevailing gender division of labor, based on the example of paddy cultivation. The description shows how some tasks are assigned to men, and others to women. Such ideological notions however only partly shaped the actual involvement of different household members in farm work. What mattered more, as I explain in what follows, is a household's overall livelihood strategy: how much women and men worked in the fields depended also on how much labor they could hire.

Gender division of labor

The way in which tasks and activities are shared and divided among the various household members was partly governed by cultural notions concerning male and female roles. An important aspect of this gender ideology related to the distinction made between tasks on the basis of the supposed physical strength required to carry them out. Tasks considered physically demanding were usually thought of as typical male tasks, while typical female tasks were those that require less physical strength and more care and patience. In general, a greater value was attached to male or heavy tasks, which was reflected in higher wages for male labor. The distinction between heavy male tasks and light female tasks appeared to be based on cultural norms rather than on the actual physical strength required to carry them out. Transportation of rice from the field to the threshing floor, for example, was considered to be physically demanding, and for that reason carried out by men. Carrying manure, which is as heavy as rice, from the livestock shed to the field was instead considered easy and light work to be done by women. In general, the professional identity associated with farming was more closely associated with men, with men's tasks generally listed as typical of farming and as what defined the job and women's tasks seen as marginal to or supportive of these more important male tasks. The gendered division of tasks and the different values attached to male and female work were part of a larger gender ideology in which women were seen to be dependent on men for survival, and in need of men's support and protection.

To give an idea of how work is assigned to the genders, I use the example of paddy cultivation. At the start of the paddy season, cleaning and soaking the seeds is women's work, while men prepare the seedbeds and sow. Before plowing, manure is often applied to the fields, which (after the manure has been carried to the field by women) is done by men and women together. Land preparation for transplanting involves plowing the field three to four times, with intervals. Either bullocks or tractors are used for plowing. Plowing is an entirely male task, and it is the one and only real farming responsibility of men in paddy cultivation. This is for instance illustrated by the answer a mother gave to her daughter-in-law, who was

complaining about the fact that her husband left all the field work to be done by her, in addition to all the household chores. "What do you mean?" her mother-in-law replied, coming to the defense of her son, "Does your husband not plow the fields for you? What more do you expect of him?" The importance of men for paddy land preparation also shows in the fact that many male migrant workers tried to be home when it was time to plow, so that they could help their wives.

After seed-bed preparation and land preparation, paddy cultivation becomes an almost entirely female affair. Transplanting is an exclusively female task; all adult and young women were involved in transplanting, at least their own fields. The organization of enough female labor for transplanting is one of the more critical jobs in paddy cultivation. Weeding of paddy fields is also mostly done by women, although men from less well-to-do households sometimes assist with this task. The amount of labor needed for weeding is not that much, although it also depends on the availability of water: with a lesser ponding depth, weed growth is more. The actual task of irrigating is done mostly by women, too. The first water gifts, those before land-preparation and transplanting, are often still done by male household members, but afterwards it is mostly women who are responsible for irrigating. Men, rather than working in the fields, spend a lot of their labor in the emergency maintenance of the irrigation system. Depending on the amount of water a particular village is entitled to (*kulara*) between 6 to 34 person-days of labor are to be provided for emergency maintenance. This implies that in the head-end villages with a large water entitlement, households have to provide labor for maintenance work almost every other day.

Harvesting and bundling of paddy are again tasks which are predominantly carried out by women. In the case of bundling, it is thought that women are much better in carrying out this task than men, because it requires careful handling and patience. However, men could also be seen in the fields during harvesting time. Men are also the ones who carry the bundles of paddy to the threshing floor, because this is a task that is considered to be too heavy for women. Still, women belonging to poorer households assisted with this task, at least in their own fields. Threshing was done either manually or with bullocks, depending on the available resources. Groups of male laborers from Tharu communities or from adjoining districts came to do threshing on a contract basis. Manual threshing of paddy was considered to be one of the most strenuous tasks in paddy cultivation. Storing straw is again a task that is mostly done by men, with women sometimes assisting. The storage of grains is done by both, while winnowing was done by men when it is done manually and by men and women together when fans are used.

Wheat and maize cultivation have their own particular tasks, some of which are also gender specific. Land preparation is the most laborious task for wheat: fields need to be ploughed and leveled three times. Wheat is broad-casted, a task that was done by men and that did not take much time. Weeding of wheat was not common, and the tasks of irrigating and application of fertilizer were usually also done by men. Wheat was only irrigated twice or thrice. When there were no men around,

women would do the male tasks or else they would hire someone to do the work for them. Harvesting and post-harvesting activities in wheat cultivation were carried out by women. Additional wage laborers or exchange labor parties were often organized to get the wheat harvest done. Threshing was done mechanically, while cleaning and storing were tasks of women. When wheat was stored, it required frequent drying and cleaning to reduce and avoid pest infestations. The head-end villages did not grow a lot of maize, since many preferred to grow mustard in spring. Lentil and mustard were the two other crops grown, which were considered easiest. Lentil was relayed with paddy around 15 days before paddy is harvested. Mustard was sown after harvesting paddy. Lentil and mustard did not require weeding, and lentil was not even irrigated.

In addition to the cultivation of crops, most households kept some livestock. Women were heavily involved in livestock rearing. Another task that tended to take a lot of women's time was fuel wood collection. If households could afford it, they would buy fuel wood. In Purbi Shankar Nagar, some households also used gas stoves for cooking. Women reported the difficulties they experienced in finding enough fuel wood. In winter (the time when fuel wood was collected for the year) men and children took over the task of cooking early in the morning to allow women to collect fuel wood. Women left early in the morning to collect one backload of wood, came back for lunch and left again after 3 p.m. Women's responsibilities also included food processing, preparation of crops for storage and the cultivation of vegetables in kitchen gardens. Cooking, washing, cleaning the house and child care were also female tasks.

The actual organization of agricultural production

The actual involvement of male and female household members in agricultural activities was only partly dictated by the above explained gendered division of labor. What and how different household members were involved in irrigation and farming was also very much a function of the household's livelihood strategy, or more specifically of the amount of off-farm income in relation to the size of the landholding. Depending on a household's livelihood strategy, crop choices also varied (table 2). Households that could afford to do so replaced family labor with hired laborers. If households had some cash income, in addition to having a relatively large landholding, they could also decide to rent their land out on a sharecrop basis. Most households identified as belonging to the middle class and poor categories tried to save money by maximizing the labor inputs of family members. Unlike in earlier days, children were hardly involved anymore in agricultural activities. This was partly because many more children attended school, but also because especially male children increasingly considered working in the fields as a low status job. They were afraid of being seen by their friends. Many interviewed people in fact complained about the laziness of their children, and of their reluctance to assist them in field related activities. They nostalgically

reminisced about the days they were children themselves, and about how much pride they used to take in assisting their parents with agricultural work.

Table 5.2. Cropping patterns by type of household, Purbi Shankar Nagar

Household type	Average landholding (in ha)	Proportion of land (%)				
		Wheat	Mustard	Lentil	Maize	Maize
		Winter	Winter	Winter	Winter	Spring
Rich	1.14	20	51	13	1	67
Middle	0.34	25	36	36	0	72
Poor	0.12	23	35	12	2	47

Source: field data, Chhattis Mauja

The organization of agricultural production in the *rich households* was either a joint affair of husband and wife (22% of the rich households), or it was done mostly by the wife. In some rich households, male members were hardly involved in farming, either because they did not have any experience in farming (56%), or because they were absent for the greater part of the year (11%), being employed elsewhere. In these cases, the responsibility for managing irrigated agriculture lay almost entirely with female household members. Women organized agricultural production either by relying heavily on hired and exchange laborers or by renting their land out on a sharecrop basis.

An example of a rich household is a de facto female-headed farm. The woman, when interviewed, recalled how she used to be responsible for carrying out all agricultural activities because her husband was employed in India. "Once my husband came for a short visit during the rice season", she told. "I had to irrigate the field at night, and my husband decided to accompany me. On the way to the field, my husband saw a snake. This made him realize the dangers I had to face while farming, and he instantly decided to return home without even having irrigated the field. He then found a sharecropper to cultivate the field for us." If the household members could have cultivated the fields by themselves, they would not need not buy any food. With the fields are rented out, the husband had to come home once a year and buy all necessary supplies for the year. He also sent his wife Rs. 1000,- a month for regular expenditures. The woman was proud of her husband and proud of the fact that she had been relieved from heavy farm work.

Other examples include that of a female farmer who owned only a small parcel of land, all of which she gave out for sharecropping, and that of a female farmer who used to give out the land for sharecropping, but this year hired laborers instead. For land preparation, she hired a tractor and a bullock; for transplanting she hired female laborers and for weeding she made use of a landless couple. She had a small

2-years' old daughter to look after, and therefore did not want to be involved in field activities herself.

If the land was not given out for sharecropping, female household members often continued to do all the 'female' tasks, sometimes assisted by hired laborers. In addition to doing field work, women were expected to prepare meals for the hired laborers.¹⁷ Whether male household members worked abroad or not, all the male labor required for irrigated farming was mostly supplied by hired laborers. In some households, a male adult accompanied the plowing team to the fields at the time of the land preparation, but even this task was sometimes carried out by a permanent hired laborer.

An example of such a is a family of five members in Naya Chaparrhati, who owned 2.68 hectares of land, plus a small plot in Kathmandu. All the children were in school. The family owned a store and a rice mill. One of their relatives helped manage the store. Most of the time, the husband was busy with political activities. In his free time, he played cards with other villagers. He was an advisor to the Sohra-Chhattis joint committee.¹⁸ His wife spent most of her time at home, except during busy periods in the fields such as transplanting and harvesting rice or harvesting wheat. During those periods, she had to prepare meals for the hired laborers. Sometimes, she also worked with the hired laborers to increase their efficiency. There was a permanent male domestic laborer in the house to help her look after the livestock and collect fuel and fodder; he also assisted in the rice mill and sometimes with fieldwork (during land preparation). The daughters sometimes helped their mother in the kitchen.

It is in the *middle-class* households that physical involvement of family members in farming was highest; they usually had reasonably large landholdings, but did not have enough cash income to replace family labor with hired labor. Family labor inputs were thus maximized, and female household members tried as much as possible to arrange for exchange laborers, instead of hiring laborers. In some middle-class households, husband and wife could be found working closely together and helping each other to carry out field activities. In others, agriculture was predominantly practiced by women, while men earned some cash income. Even though the off-farm income helped meeting the household's cash needs, it often implied that women became almost solely responsible for agriculture, and for many this experience was stressful. They complained about the large quantity of work they had to do and expressed the wish to give up farming or to give out the land for sharecropping.

17 When hiring tractors, preparation of meals is unnecessary. This explains why many women prefer to hire people with tractors rather than people with bullocks.

18 This is the highest level of the organization managing the Chhattis Mauja. It is responsible for the division of water and maintenance responsibilities between the Chhattis Mauja irrigation scheme and the Sorah irrigation system.

At the time of land preparation, a visit was paid to one of the middle-class households. The senior male member of this household was a village leader (chairman of the Shankar Nagar Tola village development committee) who was deeply involved in political and social activities. The household owned 0.36 hectare of land. The man did not earn enough to hire laborers, so his wife organized and carried out most of the tasks. She arranged exchange laborers or tried to find laborers who accept wages in kind. For land preparation, a man was contracted one day to come to their fields with a pair of bullocks to plow. The husband monitored the work and assisted by digging the borders of the field and leveling it. The woman had arranged for transplanters to come at 2 p.m. Suddenly, the husband was called away for an urgent matter by a neighbor. He left, leaving his wife to do the digging and leveling herself.

The start of the rice season was often the time of much stress for women belonging to middle-class households. Plowing, labor and bullocks, irrigation water, and transplanters all had to be arranged at a time when there was high competition for these resources.

In Kalika Nagar, a woman remembered the difficulties she experienced when trying to arrange for transplanters and labor for plowing. Her husband, who was an ex-army man, did not know how to plow, nor did her sons, who were in college. On the day she had arranged for draft animals, she could not find transplanters. Eventually, when she had found them, she could not get the bullocks. She recounted how she was crying and swearing in the field. She was almost certain that she would give out the land for sharecropping the following year.

Some middle-class households owned bullocks and men used them to plow their fields and often those of others. This provided some additional income or labor for transplanting because labor for plowing could be exchanged for transplanters.¹⁹ Rearing livestock, however, required a large amount of female labor. As one woman put it, "Every morning when I have to clean the shed, I am cursing my parents for not having allowed me to study, which would have enabled me to find some off-farm job."

The *poor households* often had fewer farm-related activities because of their small landholdings. All field activities were carried out by family members, and for labor-intensive activities such as transplanting and harvesting, exchange labor was arranged. Male members of poor households either earned some cash income through the illegal collection and sale of timber and fuelwood, or they had a low-paid job with the government. Sharecropping households could sometimes earn additional income by using the landowners' bullocks for plowing others' fields. Female members of poor households could earn additional incomes through agricultural wage labor.

¹⁹ One day of plowing was equivalent to three to five days of transplanting, depending on the location.

One of the poor households consisted of five members (parents and three children, the two youngest still in school). The father had a low-paid job in a bank in a bordering town in India. He came home every weekend. The family owned 0.09 hectare of land and had access to an additional 0.12 hectare on a sharecropping basis. They recently bought two cows of an improved breed. Because of the investments in land and livestock, they were indebted, but hoped to be able to pay back soon. The mother and the eldest daughter, who had finished high school, carried out most of the field activities, and during weekends the whole family worked together in the fields.

In all, the analysis of the intra-household organization of farming in the head-end villages of the Chhattis Mauja allows to establish that there is no reason not to consider women as users of the irrigation system, on the contrary. Women tended to spend much more time in the fields than men, and they were also much more likely to be the ones to actually water the crops than men.

For almost all households in the head-end, irrigated agriculture was primarily subsistence-oriented. Rather than aiming to produce agricultural surpluses, most households increasingly relied on off-farm incomes to supplement their earning and to generate savings. This trend of income-diversification also marked a shift from labor to capital as an important organizing principle of the internal social relations of the household: access to off-farm incomes determined crop choices and labor allocation decisions as much as access to family labor. Off-farm incomes were predominantly earned by men, leaving the responsibility for farming increasingly with women. In fact, in group interviews with women, many indicated that their main problems did not lie in irrigation or farming, but in their lack of access to wage labor. *"Why do you want to talk to us about irrigation and farming?"* an old woman asked during the interview, *"We do not like to irrigate and farm. Why do you not help us building a factory, or otherwise create possibilities that would allow us, like our husbands and sons, to do easy work for a wage?"* Remarks such as these suggested that at least for some women, their biggest concern was the prevailing gender division of labor that assigned most of the heavy and poorly remunerated jobs to them and allowed men to engage in jobs that were not only more lucrative and physically less demanding, but also higher in social status.²⁰ Among the hill migrants in the head end villages, farming was generally not considered a high status job and women were more likely to complain than to boast about their farm work. Many interviewed women considered their farm work a burden, and although some women displayed pride in their farming achievements, most complained of the hard work and expressed the wish to abandon farming.

Further reinforcing the gendered split between farming work and paid work was that fact that most parents much more strongly supported their sons than their daughters to get a good education. This, they hoped, would help their sons in

²⁰ Access to paid work itself was also a function of education and good connections, and not just created divided between men and women but also between hill migrants and Tharus, with hill migrants generally having access to the better jobs.

finding well-paid jobs outside agriculture. Many parents in fact gave priority to investing in the education of their sons over investing in agriculture. Some families even sold all or part of their land to pay for the education of their children or to cover the expenses of their sons' travel to school.

Gender aspects of irrigation management

In this section, I describe and analyze the way in which the Chhattis Mauja system is managed. In the analysis, I focus on investigating the implications of women's absence and non-involvement in formal management bodies and positions for their access to water. I start the section with a description of the *kulara* system, the logic of which lies at the basis of water distribution and labor mobilization decisions. I continue with a description of the Chhattis Mauja organization, focusing on how the system of representation works and on who are participating in the different meetings. One important hypothesis of the study was that women, because of their non-participation in the organization, would find it more difficult to satisfy their irrigation needs. This hypothesis was tested at three levels: at the level of the entire irrigation system, at the level of the village, and at the level of the household or farm. This analysis of water access is complemented with an analysis of how women and men comply with the responsibility to contribute labor to system maintenance.

The kulara system

The management of the Chhattis Mauja irrigation scheme is based on the use of the *kulara*, a unit that expresses a certain irrigation share, which is assigned to a member village,²¹ and also refers to the irrigation rights and obligations of that village. Water rights and voting rights are in proportion to the number of *kularas* held by a village, as are the amounts of labor and cash a village is obliged to provide for the upkeep of the scheme. For example, during the research period the total number of *kularas* was 177. Therefore, a branch canal with five *kulara* was entitled to 5/177 of the water in the main canal, responsible to supply 5/177 of the resources mobilized from the irrigators for maintenance and improvements, and had 5 out of a total of 177 votes in all important decisions. The total number of *kularas* is not fixed. The Chhattis Mauja executive committee controls the number held by villages according to certain rules and procedures. Each village or group of users of a branch canal can request the number of *kularas* they think is most appropriate for them. Whenever a village wants to increase its share of water, they forward a request to the executive committee. Such requests are discussed at the general meeting, along with the

21 See also Yoder (1994a) for a more detailed of the management, operation, and organization of the Chhattis Mauja irrigation scheme. Much of the information presented here, unless indicated otherwise, is also taken from his book.

implications for water allocations to other branch canals. If the request is approved, the applicants have to pay a fee of Rs 600 for each additional kulara of water. A branch canal may also wish to reduce its water allocation, which some villages in the tail end have in fact done because of the availability of water from a government sponsored tubewell program.²² One of the implications of the *kulara* system is that there is no direct relationship between the land irrigated and the water allocation for each branch canal. Villagers from each branch can decide if they need more or less water and apply to the executive committee to change their allocation.

A village that received the right to open a branch canal outlet from the main canal is considered a member of the scheme. Membership at that level thus refers to villages served by a branch canal rather than to individuals or to households. At the branch canal level, the village organizations deal with farm households. Most village organizations keep a list of households and their landholdings to assist in determining rights and obligations within the branch, but these lists are not passed on to higher levels of organization in the scheme.

Meetings and levels of organization

The final authority for decisions concerning the Chhattis Mauja irrigation scheme is vested with the general assembly, of which, in principle, all irrigators are members. As Yoder writes, all “are welcomed and encouraged to attend the general assembly meetings and participate in discussions” (Yoder, 1994a:15). Yet, in practice, only men appeared to be considered as members. Each branch canal can designate one voting member for each kulara water allocation unit it is entitled to. Only the designated kulara representatives are eligible to vote. There are no women among the branch canal representatives, and thus no female voting members in the general assembly.

Because the designation of kulara representatives for proportional representation is time-consuming and inconvenient for many irrigators, provision for another general-level decision-making meeting has been made in the constitution of the Chhattis Mauja executive committee. This is simply called a general meeting and is composed of all the *mukthiyars* (village leaders) and members of the Chhattis Mauja executive committee. Often, the so-called “knowledgeable water users” are also invited to the general meetings. The fact that women so far have never been appointed as knowledgeable water users can be construed to signify that they are not considered knowledgeable.

The constitution specifies that a general assembly meeting should be held twice a year. The members of the executive committee and two-thirds of the kulara representatives constitute the quorum for the general assembly. The agenda of general assembly meetings includes (1) the scheduling of main canal desiltation works, (2) the presentation of the executive committee's financial statement, and (3)

²² Gautam (2006), in her analysis of groundwater use in the tail-end of Chhattis Mauja, gives some examples of how villages give up, or newly request, rights to use water from the Chhattis Mauja irrigation system.

the election of the executive committee officials. The general assembly meeting is usually held at the executive committee office located in Prem Nagar in January or February, before the main canal desiltation work starts. The users are given a month's notice by the *mukthiyars* of the respective *maujas* (villages). General assembly meetings can also be called by the executive committee for amending the constitution or whenever there is a need to discuss something that involves more than one branch canal.

The idea of women attending general assembly meetings was, to many of the interviewed men and women, a strange one. Such meetings were considered typically masculine gatherings, associated with public political functions that were also seen as typically male. Women never attended general assembly meetings, because (according to the men and women interviewed) they would not be able to voice their concerns and needs at such meetings. This was partly attributed to the cultural rule that women are not supposed to speak up in front of male relatives. It would not be well seen for a woman to raise her voice or articulate an opinion in front of others. Women also referred to their illiteracy as a reason for not attending meetings; they were afraid that they would not be able to understand what was being said and thought they had little to contribute. Also, it was widely felt that the atmosphere of general assembly meetings was not suitable for women, and would even be dangerous for them. One female village level *mukthiyar* (see below) who had attended one or two meetings said she had felt very uncomfortable with the aggressive tone in which they were conducted. One meeting that was attended during the research was in fact rather charged and tense. The meeting was conducted in a very chaotic manner, and political differences among users and among users and leaders were played out in great detail and with a lot of noise. Many of the irrigators present were suspicious of the ideas and proposals of the chairman. Also among the many men who were present, many chose to remain silent rather than interfering and running the risk of becoming involved in some long-standing fights. Many of those who were out-spoken in fact belonged to the hill migrant men who had retired from the British or Indian army, and many of whom had established good connections with local government authorities and politicians. Many of the official office-bearers were also chosen from this group.

The Chhattis Mauja organization has three tiers.²³ The first is the Chhattis Mauja executive committee, consisting of 13 members. The chairman, vice chairman, and secretary are elected by ballot for 2-year terms by voting members (*kulara* representatives). At the time of the study, only men had been elected to these positions. A treasurer is appointed by the executive committee from among the male water users. Nine area-level representatives (all of whom were male) bring geographical representation to the executive committee and are directly responsible to their constituencies. The executive committee employs two *meth mukthiyars* (main scheme irrigation leaders; one for the head reach and one for the tail end) to

23 Excluding the Sohra-Chhattis Mauja joint committee.

supervise day-to-day operations and maintenance of the main scheme. Two messengers are hired to assist the *meth mukthiyars*. The *meth mukthiyar* and messengers were also all men. Interviewed people explained this by stating that the tasks of the *meth mukthiyar* and messengers are unsuitable for women—the *meth mukthiyars* have to monitor and supervise the emergency maintenance works and are responsible for making sure that water is distributed properly among the maujas. The most important duty of the messenger is to communicate information and orders received from the executive committee to the village-level *mukthiyar* and to the area-level representatives, which requires a significant amount of traveling, even at night. Supervision of technical construction works and frequent travel are not seen to be appropriately female tasks.

At the second tier are the area-level committees, which link the executive committee and the village-level committees. An area-level committee is composed of the village or branch-canal *mukthiyars*. One of the members is selected to serve as the area-level chairman for 1 year, and during that period he is the area-level representative to the executive committee. At the lowest organizational level, groups are formed to include all irrigators of a branch canal. All but ten of the forty-four branch canals serve as a single village; so most of the lower-level organizations are village based and usually referred to as village level organizations with village level committees responsible to lead in managing their affairs. The village level committee manages all irrigation activities within the branch canal. These include 1) allocating the water they are entitled to receive from the main canal among irrigators in the branch; 2) monitoring water distribution in the main canal and within the branch; 3) managing conflicts; 4) planning and carrying out maintenance within the branch, 5) assessing fines to irrigators within the branch and 6) appointing branch canal representatives to the higher level of the organization. The village level committee is also responsible for mobilizing labor for main system maintenance as directed by main system officials and for linking management of the main system with the branch canal. Except for those activities, the village committee functions as an autonomous unit.

The village level committee and meetings

The composition and precise functioning of the village committee differed from one village to another. In all cases there was a leader called a *mukthiyar*. In some villages, *mukthiyars* were elected for fixed terms and were only responsible for irrigation activities. In other villages, they were appointed by the villagers and continued to serve as long as they were willing and performed well. In a few branch canals the village-level organization consisted of only the *mukthiyar*. Generally, *mukthiyars* were elected by villagers in a village meeting. Most villages also appointed a messenger, who was responsible for communication between the irrigators and main system officials. The messenger often was the *mukthiyar's* assistant. Among the duties of a *mukthiyar* are: the keeping of records of who participated in village

irrigation work assignments; the collection of fines for absence from regular maintenance work; and the establishment water rotation schedules in periods of relative water scarcity. How *mukthiyars* were remunerated varied among branches.

There were no female *mukthiyars* when the research was conducted, and most people interviewed agreed that being a *mukthiyar* meant being a man. It was pointed out that an important capacity of a *mukthiyar* was to be able to negotiate with the *meth mukthiyar* and the executive committee chairman for extra water. People thought that such negotiating skills would be harder to find in women than in men. The success of a *mukthiyar* was also seen to depend very much on whether he or she had a good relationship with the chairman, and chances of having such a relationship were judged to be better when the *mukthiyar* shared the same political preferences. Because women were hardly involved in party politics, their chances of establishing a good relationship with the chairman were estimated to be lower. In this respect, it is noteworthy that the only woman who had briefly been a *mukthiyar* did have political experience and affiliations:

In Kalika Nagar, a head-end village with a high percentage of de facto female-headed farms, a woman volunteered to become the mukthiyar. She thought she would be able to perform well because she had gained experience in organizational matters by being the local representative of the women's wing of a political party. Other villagers shared this view and she was elected. However, she was forced to resign from her job as mukthiyar after 5 months. Nobody could be found to assist her as messenger; women did not think of themselves as capable and knowledgeable enough, and the few who wanted to assist were prevented by their husbands. Men did not want to work under a woman.

The village-level irrigation meetings (which are held once to five times a year, depending on the village) were the only meetings that were sometimes attended by women. However, as a rule women were not expected to participate, and their enthusiasm about participation was also not very high. Female household members only went to these meetings when their husbands were not around; they reported that they would only go to represent the household. When they went, they usually did not actively participate, but just observed and listened to what was being said. Women who had attended meetings reported their lack of interest in them. Instead of going to meetings, women preferred to directly meet with the *mukthiyar* whenever they had an irrigation-related problem. In most *maujas*, the *mukthiyar* is a trusted person who is well known by all the villagers. Because *mukthiyars* were so approachable, most people did not really see the absence of women from meetings as a problem.

One *mukthiyar* in a head-end village nevertheless complained about the women's non-involvement in the village meetings. According to him, the men who were present at the meetings often forgot to communicate the decisions made at the meeting to the other members of the household. In addition, in his experience, women were much more involved in water stealing than men, primarily because

they spent more time in the fields. He thought that ignorance of the water allocation rules among women could partly explain that many women stole water, while many women were also unaware of the existing punishments against such offenses.

Water allocation

If women, because of their nonparticipation in the organization, are systematically disfavored with respect to the quality and quantity of irrigation services they receive, this can become apparent at three levels:

1. *irrigation scheme level*: as indicated by villages with a greater number of de facto female heads of farms receiving less water than other villages (or experiencing greater difficulty in obtaining their fair share of water)
2. *mauja level*: as indicated by female farmers receiving fewer irrigation services or lower quality services than male farmers
3. *household or farm level*: as indicated by women's specific irrigation needs being less well accommodated than men's

Scheme level. The official rule is that water is allocated among the different branch canals according to the kulara system. If there is a continuous flow of water, water distribution is monitored and controlled by adjusting the width of the outlet from the main canal to each branch canal.²⁴ Whenever water becomes scarce (which occurs most often during rice seedbed preparation and transplanting, and for spring crops), water is distributed according to a rotation schedule. In practice, several other factors governed water distribution. The mukthiyars of branch canals frequently appealed to the chairman for extra water when water users in their branch canal complained of water shortages. In the head end, water users sometimes even appealed directly to the executive committee chairman for more water. In the attended General Assembly Meeting, some water users voiced their anger about the fact that the chairman had given in to a request by a woman for more water to irrigate her maize field.

To answer the question whether villages with a high percentage of de facto female heads of farms are systematically disfavored because of the underrepresentation of women in the organization and meetings, Kalika Nagar was studied.

In West Kalika Nagar, about 80 percent of the actual farmers were women. Many of them had husbands who were retired from the army and had never worked in the fields. Women in Kalika Nagar reported that the management of the Chhattis Mauja caused problems for them, citing two instances. In 1992, just after sowing wheat, the executive committee had decided to reconstruct the dam beyond one of the intakes, close to the intake of the Kalika Nagar

24 The width is calculated so that the ratio of the outlet width to the main canal width equals the ratio of the number of kularas served by the branch canal outlet to the total number of kularas served by the main canal downstream of the outlet.

branch canal. The water flow in the branch canal was stopped during the whole construction period, which seriously affected wheat production. In 1993, at the time of rice seedbed preparation, the executive committee repeated the mistake. Rice seeds were already broadcast in the nurseries, but could not be irrigated. The women recounted how they had to lift water from the river with buckets to water the seedbeds. The seedlings did not grow well, so they had to buy seedlings from other areas to transplant in their fields.

It is difficult to know whether these problems would also have occurred had the majority of farmers in Kalika Nagar been men. It is certain, however, that communication between Kalika Nagar and the executive committee was poor due to gender-related factors. The *mukthiyar* in Kalika Nagar had a weak personality and did not perform his task well. Female farmers in Kalika Nagar did not like to approach the *mukthiyar* because he was a drunkard and also because his wife became suspicious when he met with other women. It was difficult to find a good male *mukthiyar* partly because of the large number of female farmers in Kalika Nagar; the one woman who volunteered to become a *mukthiyar* in Kalika Nagar had to give up for reasons explained earlier.

At the same time, Kalika Nagar was among the four head-end villages that were a source of problems for the Chhattis Mauja management for taking more water than their legal share without even contributing their share of labor to scheme maintenance. A former chairman reported in the general assembly meeting, talking about these four villages "When we went to adjust the inlets to get more water during periods of water scarcity, we were often kept in the goat pen by the women of these villages. (...) Water distribution within the branch systems is not properly done. (...) The head-reach farmers never contribute labor for canal operation and maintenance. Nevertheless, they are not fined. They also use as much water as they want. It seems that our last chairman favors them so he can get their votes for election to the executive committee" (Yoder 1994a:136). Farmers in the lower parts of the system also frequently complained about the head-enders, calling them free-riders who take far more than their share of the water without doing their share of maintenance. These complaints, coupled with results of performance assessments which show that the head-end reaches received systematically more water than their entitlements²⁵ (Yoder, 1994a), suggest that there was not much reason for the female farmers in Kalika Nagar to complain. That they received (more than) enough water also showed in the fact that their fields were ponded with water during most of the paddy season, limiting weed growth. Most women in the head-end villages hardly had to do any weeding. Also, Kalika Nagar is among the head-end villages that had

25 The study showed that the head sample branch took about 30% more and the tail sample branch 30% less than their entitlement without considering infiltration losses (Yoder, 1994a:95). This, according to Yoder's analysis, not only reflects 'normal' head-tail end differences, but is also related to different soil types: "Because of lower infiltration rates and the contribution of ground water to plant growth, much less water is required in the tail of the system from growing rice than in the head end." (Yoder, 1994a:95)

transplanted their rice long before others, and they (unlike lower villages) had enough access to water to also irrigate their fields in the dry season.

Rather than making it more difficult for them to satisfy their water needs, the fact that female farmers of Kalika Nagar were not formally recognized as members of the Chhattis Mauja organization made it easier for them to take water whenever needed without being noticed or punished. Male *mukthiyars* found it somewhat embarrassing to take disciplinary action against these women, because women are seen as weaker, and men do not fight with women. Further strengthening the position of female farmers of the head end villages was the fact that many of the more influential men involved in the Chhattis Mauja management organization came from the head-end villages.²⁶ Many of these head-end men had quite some influence in the local government and at times used this influence to put pressure on the government to do something about water availability for their area. In all, women's noninvolvement in the organization, rather than being a disadvantage to them, was one factor among many that helped them to become free-riders.

Mauja level. Another indication of whether water distribution was biased against women, as a result of their peripheral position relative to formal decision-making bodies, would be that de facto female heads of farms within a mauja systematically receive less water or poorer quality irrigation services, or have greater difficulties in obtaining their fair share of water, than farms that are jointly managed by men and women. In the head-end villages studied, almost the opposite appeared to be the case. Female farmers were favored with respect to water distribution – they were the first to receive water.

The rules for water distribution differed within each mauja. In the villages studied, the *mukthiyar* used proportionality criteria as a starting point for adjusting irrigation deliveries from the main canal. For paddy cultivation irrigation was required once during sowing and then during transplanting. After transplanting, paddy fields needed to be irrigated continuously until two weeks before the harvest period. During transplantation and afterwards (before the start of the monsoon), water turns were rotated. The duration of the rotation for each household was calculated on the basis of the size of the landholding to be irrigated, and the corresponding contribution the household members made to canal maintenance. Details regarding timing and duration of the rotation were agreed upon at the village meetings. The *mukthiyar* prepared the list of households and assigned the time and duration of each rotation to each household. Either he or his messenger then informed each of the households about their turns. If he would fail to inform a household in time, he would have to pay a fine of NRs 200. All villagers were

26 In the 1989 elections of the executive committee, the 22 kulara vote representing the four upper branches were openly recruited by the chairman, and there were strong accusations of collusion between the chairman and the irrigators of the four upper branch canals for their mutual benefit (Yoder, 1994a:38/39).

normally aware of the time of their turn, and ready to receive the water and guide it to their fields the instant they were allowed to do so.

Although proportionality criteria served as the formal basis for establishing water distribution, in actual fact it was not the exactness of allocation according to official *kulara* entitlements that determined how water was distributed within villages. Rather, crop status, notions of fairness, and reduction of farmer complaints were the main criteria used by a village *mukhtiyar* to establish who would get how much water and when. Water was most often allocated on the basis of specific requests by irrigators. During paddy seedbed cultivation in one of the studied head-end villages, for instance, farm households were informed in advance of the day on which water would become available for sowing. On the assigned day for sowing, the *mukhtiyar* himself arranged water for every household by personally going to their fields. His attempt was to provide water to anyone who was ready to receive water on that day. This sometimes implied that farm household members had to irrigate their fields at night. This *mukhtiyar* indicated he often gave priority to female farmers, because for female farmers it was often more difficult than for farmer couples to simultaneously arrange the male laborers and bullocks or a tractor needed for land preparation, as well as the female laborers needed for transplanting. Female farmers reported that when they had arranged bullocks and transplanters, they would inform the *mukhtiyar* that they needed water. Their fields were often among the first to be irrigated. In other villages as well, *mukhtiyars* agreed that they had a tendency to prioritize female farmers when arranging water turns.

Overall, and even though the lack of information and influence of female farmers could be a potential cause for a lesser access to water, the evidence of female heads of farms in the head end villages suggests that they did not experience any particular problems in receiving their due share of water at the right time. At the same time, the already cited reflections of a village *mukhtiyar* about women stealing water seems to also suggest that female farmers, more than men, had other possibilities to get the water they needed: for them it might have been easier to steal water without being found out or punished.

Farm level. A last level at which women's non-participation could negatively affect their water access is at the household level. To examine this possibility, it first needs to be established whether women have specific irrigation needs different from those of men. In the studied households, women and men held the same opinion with respect to the objectives of irrigated farming: both expected to obtain yields high enough to feed the family. Women were nevertheless more concerned than men about the amount of labor certain crops required. This is why many women were eager to plant less wheat and more maize.²⁷ When discussing criteria for assessing irrigation supplies, male farmers stressed the importance of having enough water to

²⁷ In addition, because women attach great importance to having enough oil for cooking, they often expressed the wish to expand the area of their only oilseed crop—mustard. However, this hardly affected irrigation requirements, because water is not a constraint for growing mustard.

transplant on time. Female farmers did not disagree, but they mentioned that, in addition, water should be sufficient during the rice season to prevent weed growth. Women explained that the inadequacy of water during the season led to frequent stealing of water; when they would go to irrigate the fields and close all the upstream field inlets, it often happened that these were opened again by upstream users before water actually flowed into their field.

The evidence did not suggest that women's noninvolvement in the organization would negatively affect the amount of water available during the rice season. On the one hand, both women and the village *mukthiyar* reported that there was nothing to prevent women from meeting with him. In fact, when women had a request or a complaint to make regarding the quality of irrigation services, they would go and meet with the *mukthiyar*. The *mukthiyars*, in general, would try to be responsive to their need for more water, and would for instance make an appeal to the chairman for additional water. On the other hand, as one *mukthiyar* noted, women were often the ones who would steal water if there was scarcity during the season. Because there is a fine for stealing water, women had an interest in not being noticed. Their absence from the organization may have served women in this regard.

Unlike men, women said that it would be easier for them if some water would remain available in the canal permanently because this would facilitate the use of water for a number of nonagricultural tasks they were responsible for. Many women washed their clothes and cleaned pots in nearby irrigation channels, and they also used this water for feeding and watering livestock and cleaning the livestock sheds. Women explained that Shankar Nagar Tola had a domestic water supply system, but it only operated a few hours a day and at times inconvenient for them. In Naya Chaparrhati, most households had access to hand pumps for domestic water, but women said that it was difficult and time-consuming to pump the water for washing and cleaning, and even more so for feeding and watering livestock, so they preferred to use irrigation water. It could be argued that shortage of water for domestic uses and livestock was a specific problem for women that might have been better addressed had they been more involved in the organization. However, it could also be argued that this problem was caused by the inadequacy of the domestic water supply systems, in which case the irrigation organization cannot be held accountable.

When discussing gender-related irrigation problems, many *mukthiyars* mentioned night irrigation as specifically problematic for women and as a topic that was frequently brought up at meetings. Both male and female farmers indicated they were reluctant to irrigate at night, mainly out of fear of snakes. Nonetheless both women and men accepted that it was unavoidable having to irrigate at night every once in a while. When their turn is at night, they tried to find someone to accompany them. Because of an overall ideology that preaches women's vulnerability and their need of male protection, women's complaints about night irrigation might be taken more seriously than men's.

Resource mobilization

Labor is mobilized in the Chhattis Mauja irrigation scheme for the maintenance of the head dam, the main canal, and the village canal. Regular maintenance of the head dam was carried out during winter months, and emergency work was carried out whenever the need to do so arose. Each mauja has to contribute a fixed number of kularas for maintenance work. The *mukthiyar* informs the villagers when and where to go for maintenance work. The number of kularas to be contributed by each household is determined at village meetings. In case of nonparticipation or failure to contribute the required amount of labor, penalties are levied. Offenders had to pay a fine of Rs 30 per working day. Fines formed the major source of income of the executive committee. This income was spent for staff salaries and construction materials. The amount to be paid as a fine was less than the existing wage rate for men (Rs 45 to 50 per day), which was explained by the executive committee chairman as a measure to ensure cash income to the Chhattis Mauja organization – if the fines were higher, then nobody would pay them anymore.

Just like organizational matters, construction and maintenance of the irrigation scheme were considered male domains in the Chhattis Mauja. In fact, the executive committee constitution stipulated that labor for emergency maintenance and maintenance of the head dam and the main canal could only be contributed by men. The chief explanation Chhattis Mauja officeholders gave for this rule is that women were physically less able to carry out construction and maintenance activities. Women's labor, in other words, was considered to be of less value. Sending female laborers to do maintenance work would therefore imply contributing less, which would be unfair. Male villagers also explained that male laborers, when carrying out maintenance activities, tend to crack jokes and engage in behavior that might embarrass women. The explanations that most interviewed women gave for not being allowed to contribute labor referred to the social undesirability of women working alongside 'strange' men. Women from the middle and tail-end sections also stated that it would be inappropriate for them to contribute labor to maintenance of the head dam because it would require traveling and working in places unknown to them, far from their homes.

In households where men worked abroad for long periods, the constitutional rule that prohibits women from carrying out maintenance work implied that they either had to hire male laborers to do the work, or they had to pay the fine. Except for the richer households, paying the fine was not an option since it would imply spending a large share of the total household income. Some families explained that they had given out their land for sharecropping only because they could not afford to pay the maintenance fines; the sharecropper household then becomes responsible for contributing labor to the irrigation scheme. In other households, women had made arrangements with a male neighbor to go in their place, in return for which they would work in the neighbor's field. In many *maujas*, however, special arrangements were made to accommodate households facing difficulties in complying with the *kulara* rules. In some, a provision was made to allow households

to make a contribution in cash instead of providing labor.²⁸ Whether or not such a provision existed depended on the total number of kularas to be contributed by the mauja in proportion to the availability of labor. The amount to be paid was determined by the village-level committee, and in the villages studied it was around Rs 670/ha. Who among the irrigating households was allowed to pay instead of providing labor was also decided at the village-level meeting, and female heads of farms were often given priority in this decision. In one village (Pedrahani), female heads of farms were even allowed to pay only half as much as others had to pay because of the recognition of their difficulty in paying the full amount.

In West and East Kalika Nagar, both of which are close to the main intake, the rule that women should not provide labor for maintenance was not adhered to because it was impossible to mobilize enough male labor from these villages (in which around 80% of the farms were headed by women). Women from these villages did participate in the maintenance of the head dam. The actual construction work was carried out by men, while women transported the construction materials (mainly logs and wood). Because these villages are close to the intake, women did not have to travel far to contribute labor, which made it easier for them to go. Another reason that made it possible for women to participate in maintenance work, despite the rule, is that many of them belong to the Magar ethnic group, the group of hill migrants, for whom the rules restricting female mobility are less strict than for the Tharus in the other parts of the system. In these villages, women provide around 80 to 85 percent of the total kularas from these villages.

It is noteworthy that for many years the head-end villages of Kalika Nagar and Shankar Nagar Tola did not contribute any labor to the maintenance of the main canal. The reason to refuse contributing labor was that maintenance in the lower reaches of the canal would not benefit them, so they argued that they should be released from doing this work. After several years of conflicts, it was decided that these villages must provide relatively more labor for maintenance of the head dam.

Conclusions

Although there were no official or written rules preventing women from participating in the Chhattis Mauja organization, there was not one female representative, *mukthiyar*, *meth mukthiyar*, or officeholder, nor did women ever attend general meetings or general assembly meetings at the time of the study. Women's participation at village-level meetings was very low, and when they did attend meetings they were inactive. At the same time, women in the studied head-end section of the Chhattis Mauja system constituted more than half of all users: the female members of farms that were jointly managed by men and women were very

²⁸ The cash contributions were smaller than the potential fines.

much involved in irrigated agriculture, and there were a large number of farms entirely managed by women.

In the Chhattis Mauja setup, the prevailing gender division of labor extended to a division in irrigation-related tasks, with men being primarily responsible for the *provision* of water (organizing water allocation and mobilizing and providing labor for irrigation scheme maintenance) and women, in their capacity as farmers, being primarily responsible for the actual field-tasks of irrigating, applying water to crops.²⁹ In the Chhattis Mauja irrigation scheme, and contrary to what earlier studies claim, the group of users was thus not identical to the group of managers. In other words, one of the key 'rules' of success of FMIS was not adhered to in the Chhattis Mauja case: the rule that those involved in resource use take part in decision making about the resource. This is Ostrom's design principle number 3: "Most individuals affected by the operational rules are included in the group that can modify these rules." (Ostrom, 1990:70) Non-adherence to this crucial rule should, in theory, become visible in performance weaknesses. The study did not include performance measurements, but earlier assessments of the Chhattis Mauja were quite positive about its performance (Yoder, 1994a). Without disputing these findings, the case study of this chapter revealed two potential areas of performance improvement in terms of distribution efficiency. For one, the study suggests that the fact that the head end villages received systematically more water than their entitlement may be related to the fact that many of these villages' farmers were women. For the described case of Kalika Nagar, Ostrom's theory may well hold true in that the absence of a majority of users from the organization not only helps explaining why this village is able to take more water than its entitlement, but also 'pays' less for this water by not contributing the stipulated amount of labor. Also the difficulty reported by some *mukthiyars* in punishing women for stealing water can be seen as a performance weakness that stems from the non-adherence to the Ostrom rule no. 3 (Ostrom, 1990).

The study thus seems to confirm institutional theories such as those of Ostrom that emphasize the importance of the involvement of *all* users in the organization of the irrigation system. Based on the study, it could be argued that one potential way of improving the performance of the system lies in improving the participation of women as members in the Chhattis Mauja organization. I use the rest of this concluding section to argue that this line of argumentation is valid in itself, but that it does not go far enough. This argument is based on asking the question about the non-involvement of women in the organization from the angle of the main

29 Such a division of labor has been reported for many other farmer managed irrigation systems in Nepal. See for instance: Poudel, 2000; Schaaf, van der, 2000; Bajracharya, 2000; and Pun, 2000. Poudel, in his study of the Thulator irrigation system in Rupakot (Nepal), even recounts that General Assembly meetings were planned on Saturdays to allow the men, many of whom lived outside Rupakot, to attend the meeting. Here as well, most of the full-time farmers were women, but men, even though many did not even live in the village, were considered the water decision makers and members of the water users' organization (Poudel, 2000).

hypothesis of the study, which was that exclusion of women from formal participation in decision-making bodies would constrain their ability to get their needs accommodated. The evidence from the Chhattis Mauja does not confirm this hypothesis, at least for the case of women from the head-end villages. Women, although they were – with the exception of village-level meetings – excluded from formal management, succeeded in getting their irrigation needs accommodated.

When asked, women in the head-end, including female heads of farms, saw no need for formal participation in the organization, and most women completely lacked interest in it. This is partly because of the gender division of labor referred to above, which clearly marks public meetings and organizations as masculine domains. For a woman to raise her voice or articulate an opinion in for instance a General Assembly meeting would reflect very negatively on her social status *as a woman*, and it would harm her reputation. For women, it would be far more effective and less time-consuming to personally meet with the village *mukthiyar* whenever they have a problem. Indeed, the study findings suggest that it was partly *because* they were not formally members of the Chhattis Mauja organization that women succeeded so well in getting their irrigation needs accommodated. The same ideology that prevented them from formally participating in the organization and that preached their lower status and vulnerability, allowed female heads of farms to reduce their contributions to the maintenance of the scheme, without risking a reduction in the amount of water they received. Female-headed households in different villages were also allowed to pay smaller irrigation fees, while women were often among the first to receive water, and were reported to steal water without being noticed or punished. Here, it is important to note that female farmers in the head end were in the position to use their gender to their advantage also because of the political influence and protection of their husbands, and because of their convenient location at the head-end section of the system. Yet, in all it can be concluded that women's short-term interests with respect to irrigation would not be served by challenging the prevailing gender ideology nor by promoting their formal participation in the organization.

This conclusion generates some questions about the linkages between gender, power and water that are pertinent for the central question of this thesis. These questions tie in with the observations made in chapter 3 about water users' organizations. First, these are not the relatively isolated domains that institutional thinking suggests, in which the behavior of members is primarily determined by the rules and laws internal to this domain. And second, water powers and decisions do not just happen within this formally designated domain of the water users' organization, but also occur in other – partly overlapping – domains. I further elaborate these points below.

Towards an embedded understanding of water users' organizations

The most common approach to make sense of the non-participation or exclusion of women from irrigation management decision making processes follows conventional theories about the determinants of well-performing institutions, epitomized in the work of Ostrom (1990). These theories consider user organizations for water resource management as the main (and sometimes single) forum for decision making, the location where rules and regulations, punishments and rewards for collective action in water are generated. It is through these institutions that the contributions from members necessary for operating and maintaining the infrastructure are mobilized and channeled, and that the ways in which water is managed is regulated. When seen from the perspective of these theories, the non-involvement of women in the organization is a problem when women are among the users of the system, or among those affected by the operational rules. Their non-participation would not only negatively affect their possibilities for meeting their water needs and concerns, but would also imply an institutional performance weakness because of the lesser ability of the scheme's management to enforce its rules on women.

In chapter 3, mention was already made of the fact that such institutional theorizing reflects a politically liberal understanding of democracy, founded on the autonomy of the political in a strong form. The water users' organization and the irrigation management decision making processes that go on within them, are seen as (and indeed ideally need to be) insulated from what are considered (in liberal terms) non-political or pre-political processes, those characteristic for instance of the economy (or the market), or the family (the household) (cf. Fraser, 1997). The theory not only assumes, but also actively proclaims the possibility and desirability of a 'power-free' domain of deliberative interaction in which social differences and inequities are effectively set aside, and in which participants speak to another *as if* they are social and economic peers. Importantly, the success of institutions is seen to be, in part, a function of the success with which they have achieved this insulation of water management from the rest of the world.

Following this theoretical model, conventional 'gender and development' policy wisdom tends to focus on the identification and removal of formal entrance barriers for women, hoping that once inside the water management domain women can operate *as if* they are socially equal. The presented evidence suggests that such bracketing is not all that easy. Women's freedom to publicly interact with men is constrained by social practices and norms that define what sorts of interaction are permissible, with which men, in what contexts, and using defined modes of conduct (Agarwal, 1994). The evidence from the Chhattis Mauja not only suggests that active involvement with irrigation management tasks is denoted as a masculine task. Observations during water management meetings also suggest that discursive interactions within the public domain of the water users' organization are governed by protocols and styles of decorum that are themselves correlates and markers of gender difference and inequality (cf. Fraser, 1997). Women said they felt

uncomfortable with the aggressive tone in which matters were discussed at meetings, while they also referred to the prevailing gender ideology which discourages outspokenness in a woman to explain their reluctance to play more prominent roles in irrigation decision making. Strikingly similar evidence is reported in other studies.³⁰

Gendered norms and divisions thus function informally to marginalize women and to prevent them from participating as peers. Skills and abilities deemed necessary to function well in meetings, or to engage in other irrigation management tasks, are thought to come more easily to men than to women. What is more, they tend to be evaluated positively when found in men and negatively when found in women. Laurel Bossen's explanation of men's dominance in community decision making adds a dimension to this analysis, in interpreting women's confinement to the 'private' domains of the household and the fields as a partial response to the experience of many men in working with the army. Such work "ingrains in them the worth of achieving authority through might, not labor" (Bossen, 1989 cited in Jha, 2004:561). Although probably not as generally applicable as Bossen suggests, the fact that many of the men in the head-end of Chhattis Mauja who were influential in the organization were ex-army men may certainly have inspired in them an ideology that sanctions and institutionalizes the association of masculinity with political influence, that devalues physical labor and that portrays women as economic dependents and socially and politically inferior. In all, such interpretations suggest that the ability to be heard and listened to, to articulate opinions in public and to engage in public debates are often markers of masculine 'distinction', ways of defining and reconfirming masculinity and male superiority. Since such markers are attached to membership and participation in the water users' organization, the water users' organization itself becomes a way of defining and reconfirming existing gendered norms and practices, of performing masculinity, of distinguishing a separate male 'public' domain from a female 'domestic' domain and of the gendered exercise of power and domination.

Taking the argument one step further, it could be said that gender inequalities and the exclusion of women from management are *constitutive* of the very functioning of the organization. It might be that it is *because* (some) men were freed from their farming and irrigating jobs by their wives, and by hired laborers, that they could engage in the tasks of organizing and managing the scheme. The widely acclaimed success of the Chhattis Mauja might thus not be achieved in spite of, but thanks to the exclusion of women (as well as many Tharu men). Such a reading is in line with that of some other researchers who, although most do not refer to gender,

30 Other examples from Nepal include van der Schaaf, 2000; Bhushan Udas, 2000 and Bhushan Udas and Zwarteveen, 2005; and Poudel, 2000:136. Similar evidence is also reported for other countries. See for instance Krol, 1994 (Ecuador) and Kome, 1997 (Sri Lanka). It concurs with observations from participatory forest organizations (Sarin, 1995) and agricultural cooperatives (Mayoux, 1995). In earlier writings I have discussed these examples in more detail. See Meinzen-Dick and Zwarteveen, 1998 and 2001; and Zwarteveen and Meinzen-Dick, 2001.

show that water users' organizations function because of and through existing social hierarchies. In the introduction I already referred to the work of Wade, who attributed good performance of community organizations to the fact that their leaders were drawn from the elite, wealthier people who had the authority to make decisions because of their power and prestige (Wade, 1987). Mosse, in his various writings, attributes the functioning of water users' associations, at least in part, to the fact that water users' organizations are embedded in the societies in which they function, rather than insulated from them (as the liberal view has it) (Mosse, 1999). Also, Adhikari and Pradhan, analyzing water management in another farmer managed irrigation system in Nepal, conclude that control over decision making and the authority to make decisions are not just derived from criteria internal to the organization, but the result of historical processes of investments and of ethnicity-based social relations of power (Adhikari and Pradhan, 2000). More examples exist to show that existing social divisions and inequities provide the fabric of which water management institutions are woven.

Revisiting the linkages between membership, organizations and power

Policies and interventions often view the water users' organization as the single domain in which irrigation decisions are taken, and as the place where irrigation powers are concentrated. Such a view informs the idea of women as 'excluded' from management decisions: they are not there where researchers and policymakers tend to assume management powers are located. It leads to analyzing gender and other social relations as questions of in- and exclusion. Gender itself tends to become defined primarily as a form of exclusion and social disadvantage. Membership criteria and the appropriateness of timing and location of meetings become the main (and only) gender questions, centering around whether and how women and men can and should be included in the formal management domain. Such analysis suggests a unitary notion of power in which the included are powerful and the excluded are powerless. The evidence from the Chhattis Mauja suggests, instead, that irrigation management powers are uneven, uncertain and struggled for rather than concentrated in the hands of the included (cf. Jackson, 1998b). Long observed that "the question of non-involvement should not be interpreted to imply that nonparticipants have no influence on the constitution and outcomes (...) On the contrary, they can as 'backstage' actors, have a decisive influence on strategies and scenarios (Long, 1989:240). Power is not just there where the men are, even though women's own direct water interests may well be better served by maintaining and reproducing the portrayal of irrigation as a male domain, requiring specific male dexterity, skills and strength. Such portrayal helps delegating the costs and responsibilities of accessing water to men, and allows women to remain relatively invisible and thus freer in their irrigation behavior. In other words, women's irrigation powers may be located partly in their invisibility and absence from the

water users' organization. This carries fewer costs, and allows women to remain within the boundaries of what is considered as appropriate for women.³¹

In all, the Chhattis Mauja study clearly illustrates that 'making gender visible' in irrigation management consists of much more than allowing women (discursive or material) entrance into the male dominated and designated irrigation domains. It also and importantly consists of redefining these domains in ways that allow recognition of women's work and powers as constitutive of irrigation management. It includes a critical investigation of who defines and draws the boundaries of the domains, and of which and whose political agendas and interests are served by such demarcations. And it requires moving away from a-priori assumptions about the meaning of gender, and from conceptualizations that place women in a separate water user category next to the already identified and existing one of men.

31 Bettina Bock, in her study on the (lack of) participation of women in farmers' organizations in the Netherlands, comes to a similar conclusion. See Bock, 2002.

Struggles over resources and meanings. Gender in Andean irrigation.

For nothing would I want to be a woman. I want to be a man, that's all. I would not like (to be a woman) because they work so much, they cook, they do everything, and they also wash clothes. They work much more, at least that is how I see it. (Male farmers, cited in Tuitelaars de Quitón et al, 1994: A-10)

This chapter moves to yet another continent and region, that of the Andes in Latin America. The Andes provides an interesting irrigation context in that struggles over water access and water rights form an integral and important part of larger struggles that have characterized the Andean history between indígena and peasant groups on the one hand and Spanish and mestizo hacienda-owners on the other. These struggles are as much struggles over the right to be different, or over cultural recognition, as they are struggles over the (re-)distribution of resources, especially land and water. They occur at different levels, and take different forms. One important area of contestation, and one that we¹ will focus on in this chapter, lies in the discourses used to articulate water problems and solutions.

Water struggles thus partly occur over meanings and discourses, and gender questions are an intrinsic and central part of such discursive struggles – and the focus of this chapter. In view of the focus and objective of this thesis to think and represent gender in irrigation, it is insightful that in the Andes mainstream and conventional ways of thinking about irrigation realities are actively challenged by

1 This chapter was written together with Rutgerd Boelens, which explains use of the pronoun 'we'. It is based on Rutgerd's experiences on gender and irrigation in the Andes (see for instance Arroyo and Boelens, 1997; Arroyo and Boelens, 1998, and the video "The Right to be Different", AGRAPEN, 2003), on my earlier work on gender and water rights (Zwarteveen, 1997) and on our joint research and work of more recent years (much of it as part of the Water Rights and Indigenous Rights project (WALIR)) in which we reviewed the literature on gender and irrigation in the Andes in attempts to better identify and understand the gender questions that are pertinent to Andean irrigation (see Boelens and Zwarteveen, 2002; Boelens and Zwarteveen, 2003). It also importantly builds on our work on legal pluralism and water; see Roth, Boelens and Zwarteveen, 2005.

representatives of irrigators. They demand that water realities be portrayed and understood in ways that reflect their experiences and priorities, and that value their ways of being and living. The Andean situation clearly illustrates that discursively representing irrigation realities cannot be done in a vacuum or from a politically and socially neutral or objective position. All knowledge about irrigation is itself deeply political and there are often important linkages between the ways in which certain representations define and conceptualize problems and solutions, and the political agendas they promote. All produced knowledge presumes a situational and political perspective of the knower, and some representations of water realities serve some groups, interests or purposes, better than others.

The co-existence of several conflicting representations, and of several very differently positioned knowers and sources of knowledge, raises a dilemma between 'truth' and 'solidarity'.² This dilemma invokes questions of epistemology (what is true, which claims to truth are acceptable), of discursive authority and political representation (who has the legitimate authority to speak, and on behalf of whom), and indeed of solidarity (whom to identify with and whom to impress or convince). Do legitimacy and authority come with the most accurate representation, with 'seeing better' as is often suggested in many writings? Or do, instead, truths come into being because the powers-that-be recognize and endorse them? These questions form the background to this chapter, in which we critically explore how the various irrigation discourses that exist in the Andes represent gender and irrigation realities. The questions also form a prelude to the discussions in the last and concluding chapter of this thesis, about the linkages between 'visibility', power and knowledge.

The chapter examines how the responses to the gender gap in rights to water are shaped by the ways in which different discourses frame issues of rights and responsibilities in irrigation. Interestingly, among those who (claim to) represent the 'oppressed' and 'marginalized' indígenas and their organizations are some influential thinkers who portray gender relations in ways that celebrate rather than question existing gender relations. In their representations, gender differences are interpreted as complementary, and relations between the genders are seen as harmonious, just as those between indígenas and nature. This discourse of the so-called andeanists either denies the existence of gender-based forms of discrimination, or ascribes those to 'external' forces, most notably (neo-) colonialism. The andeanist narrative clashes with those of some feminists and gender analysts, who are trained to be deeply suspicious of accounts of the family and the community in terms of harmony and bliss, because they have come to know such collectivities as the key sites of gender struggle. Very unlike the andeanist accounts,

2 "Solidarity or objectivity" is the title of an essay by the pragmatist philosopher Richard Rorty in which he contrasts a realist epistemology with a pragmatist one. Important in this essay is his plea to debate questions of truth in political and moral terms, rather than in epistemological terms and his abandonment of any transcendence - all knowledge is historically and geographically contingent (Rorty, 1986 - 1990 (in Dutch)).

their analyses are aimed at showing and proving the existence of gender-based inequities and injustices.

And there is more at stake. In discussions with some female professionals working in water in the Andes, many of them rather angrily rejected the gender analyses of western (or western trained) gender analysts. Although they shared their criticism of mainstream irrigation discourses, they did not find much inspiration in the analyses of western or western trained feminists, and they disagreed with the gender images produced by these gender analysts. Their disagreement and anger was partly about representational errors, and partly about the political effects of certain images. It was, however, also and perhaps more importantly about the power and authority to establish one representation as dominant. Slightly overstating it, it was anger about the fact that donor funding allowed western gender analysts to project their own petty bourgeois feminist concerns onto Andean realities.³ Anger about the arrogance and power of the knowers, therefore, as much as anger about the lack of accuracy of their representation, was why some of these water professionals preferred representations by those with whose struggles and objectives they could more easily sympathize – representatives of indígena movements – over those of western feminists.⁴

In what follows after this introduction, we identify three discourses that each differently describe and analyze the linkages between water control and gender equity. None of these, in our opinion, do justice to the complex and sometimes contradictory realities and experiences of men and women in the field. However, and importantly, the discourses do not (just) serve the goal of representational accuracy, and they are not (just) used and reproduced on the basis of ‘truth’. What matters as much or even more are their political effects: which political agendas do they serve, whose interests do they promote? Indeed, their relation to reality is not (just) one of correspondence, but also one of simplification chosen for the sake of workability and legitimacy (cf. Law, 1994). Therefore, in addition to discussing their representational accuracy, in this chapter we also trace how the different discourses lend support to or undermine struggles for goals of gender justice. Our analysis suggests that with all three discourses there is a risk that the views and experiences of female irrigators are marginalized or distorted. We therefore suggest that the project of extending visibility and legitimacy to women as political subjects, and to gender as a concern, in the Andean irrigation sector requires a reformulation of water problems and solutions in ways that critically question and explore (rather than assume) both the meaning and value of gender, as well as that of collectivities. It also, and importantly, requires a specification and contextualization of *what* is

3 Thanks to Zulema Gutierrez for explaining this (Gutiérrez, personal communication, 2004).

4 Patricia Richards describes a similar experience in her article “The politics of Gender, Human Rights, and Being Indigenous in Chile”. She for instance writes: “Many of the women whom I interviewed were reluctant to talk about gender discrimination within the Mapuche movement because of the way such information was often distorted in feminist research”. See Richards, 2005:202.

contested and at what level, for water struggles take place at different levels which each have different actors, different stakes and different rules and norms. The implication for *knowing* gendered irrigation realities is that any analysis of water struggles needs to include a critical reflection of how different discourses are strategically used.

After having described the three discourses, we continue the chapter with our own construction of gendered irrigation realities, based on a review of gender and irrigation studies in the Andes. We focus our analysis on water rights and water control, and start from the insight that water control comes about in different social domains of interaction, in which different social actors participate with different powers and responsibilities. These domains are always gendered, both in their composition as well as in the norms and rules that guide how people behave in them. We have identified three such domains - the household, the field and the water users' organization - and discuss each of them separately. Before embarking on this effort, we show how the different ways in which people can obtain rights to water are gendered, since the gender 'gap' in water rights provides the most obvious starting point for identifying gender inequities in irrigation. We continue with identifying if and how irrigation needs are gendered, primarily to dismiss the ideas that irrigation is an exclusively masculine domain or that women have specific irrigation needs *as women*. In the Andes, irrigation is something in which both men and women are involved, and irrigation needs and responsibilities are only very partially determined by gender. We end the chapter with an attempt at identifying discursive spaces for feminist representation pertinent to Andean irrigation realities, and with some reflections on the linkages between discourses, power and representation. These reflections lead into questions about the very possibility of seeing, knowing and representing, questions that pertain to the thesis as a whole, and that will be further dealt with in its last concluding chapter.

Gender discourses in the Andes

We have identified three different discourses⁵ on the position and rights of women in irrigation that are referred to and used in field studies, policy debates and on-the-ground water management discussions. The first of those can be identified as belonging to 'the mainstream' in that it roughly represents the views of those with the formal powers to implement water decisions. The two other discourses both

5 A fourth and increasingly influential discourse that can be identified is the neo-liberal discourse. We have chosen not to describe and discuss this discourse in this chapter, partly because it would open up a whole other terrain of contested meanings and resources that deserve more space than we can attribute to it here. Another reason is that in this thesis I have chosen to focus on encounters between 'feminist' and 'engineering' discourses in a more narrow sense. I (and we) have explored the (gendered) implications of neo-liberal water discourses and policies elsewhere - see for instance Zwarteveen, 1998; and Boelens and Zwarteveen, 2005a and b.

challenge these 'mainstream' discourses: the first refers to an interpretation of a 'feminist view' and the other is a particular representation of the 'Andean worldview'⁶. All three discourses are influential, and the chosen 'regime of representation' importantly determines what is studied, which questions are asked and which solutions and intervention strategies are proposed.

What follows is a schematic and admittedly stereotypical description of these discourses that serves to schematically typify how they tend to frame gendered irrigation realities. In these descriptions, we focus on gender and water rights, and more in particular on ideas about how water responsibilities, rules and rights are linked (or should be linked) to the genders in order to organize water control. The starting point of these descriptions is the existence of a gender 'gap' in rights to water (see also the next section). Like elsewhere in the world, rights to water in the Andes are largely vested in men. The different discourses have different views on whether this gap is a cause for concern. In what follows in the sections after this one, we compare and confront these discursive story-lines with realities as constructed by ourselves on the basis of a review of gender and irrigation studies. This is why we do not further discuss the merits, internal consistency and assumptions of the identified discourses here.

The 'Engineering' discourse

A description of the first 'mainstream' discourse, the one that belongs to the irrigation tradition, is already given in chapter 3. Because of its close ties with development cooperation, the form it tends to take in the Andes has a preoccupation with projects that are bounded in time and space, and that have clearly defined objectives that need to be met with an agreed amount of (financial and personnel) means. Those objectives are derived from universally applicable standards and are based on ideals of technically rational and optimal modes of production. At the same time, mainstream irrigation thinking in the Andes is heavily inspired and influenced by what Lynch called the 'bureaucratic tradition' (Lynch, 1993) in irrigation, and largely continues to promote a technocratic liberal modernization project. As was explained in more detail in previous chapters, this project is based on a household model with a division of labor between household members that can be explained by comparative advantage, and which predicts that household welfare distribution is guided by altruistic principles. Women's responsibilities are primarily seen as those of mothers and domestic care-takers, whereas men are primarily considered breadwinners: farmers, irrigators, and water leaders. In many Andean irrigation projects, such assumptions have served to justify allocation of all rights to infrastructure and water to the 'heads-of household', which according to official registration in most cases are men. Legislation and policies at national levels have often provided further legitimacy to such prioritization of men over women, and

6 The labels given to these discourses are put between inverted commas to indicate that they do not form fixed, stable and coherent frameworks of thought.

continue to do so. Women also rarely figured among those identified by irrigation project staff as the ones with whom to negotiate about new projects. 'Masculine' themes were discussed among men. Changes in the international development consensus have decreased the popularity of this 'mainstream' discourse, which is why it is probably no longer very explicitly adhered to at policy levels. Yet, it continues to be very much alive in the thoughts and practices of staff of irrigation agencies and projects who were trained in this tradition (see also van der Pol, 1992; Campillo, 1993; Carafa, 1993; Lynch, 1993; Krol 1994; Vera, 2004) and also try adhering to it in their own (urban, mestizo) households. Its ideas may coincide with and be reinforced by those of middle-class urban *machismo*, which couples a strong undervaluation of women's productive labor capacities and capabilities with the idea that a woman's place is in the home (*marianismo*) (cf. de la Cadena 1996; Arnold 1997, León 1993).

The 'feminist' discourse

The second discourse, the 'feminist' one, has its roots in feminist scholarship of the eighties. The desirability of autonomy for women lies at its heart. The analysis sees women's lack of property and independent entitlements as one of the main manifestations and root causes of gender inequality (Mies, 1986). In logical consequence, increasing individual women's control over resources is identified as an important avenue for a better future. An important element of the underlying analysis is a critique of conventional, neo-classical household models. Feminist (and other) scholars have criticized this model for excluding gender based differentials in labor, resources and power from its explanation. A feminist analysis interprets intra-household differences as the result of *structural inequalities*. Not all members of a household are equally empowered to meet the full array of objectives encompassed within the household collectivity: membership is internally differentiated by material and ideological constraints which influence *which* objectives, and more importantly *whose* objectives are actually realized. Household decisions, strategies or behavior cannot be understood as the logical aggregation of its members' individual choices and preferences, but rather as the outcomes of processes of negotiation and bargaining in which certain members have more power to implement and decide than others. For Andean peasant women, striving for liberation is projected as a daily struggle on multiple fronts: against poverty and class subordination, ethnic discrimination and gender oppression in a male dominated society (Bronstein 1982). As an alternative to the neo-classical concept, the household and the community are seen as moral and political economies, in which distribution takes place according to principles of both legal and accepted legitimacy, but also reflects power relations (Sen, 1990; Kabeer, 1991; Agarwal, 1997a).

In terms of a 'feminist' water strategy, this discourse preaches the importance of women's independent water titles. Assuring access to separate property rights for

both male and female household members would reduce internal household dependencies and thus be conducive to assuring each individual's autonomy. Women having their own titles would also open the door for women's entry in water decision making at all levels. The analysis of one of the first studies to mention women in irrigation systems in the Andes, that of Bourque and Warren, reflects this 'feminist' view. They describe how irrigation in their Peruvian research location was considered a men's job, one of a set of key tasks that "serve as gateways to critical resources", including land, water, transportation and cash. Because of women's dependency on men for their access to water, they argue, irrigation plays a crucial role in maintaining male dominance (Bourque and Warren, 1981:119-123). Deere and León follow a similar line of analysis for land rights, pointing out that male migration has made women throughout Latin America the primary farmers in small-scale agriculture. Property rights in their name would ensure farm productivity; improve their access to credits and services, in addition to enhancing women's bargaining position within the household and the community (Deere and León, 2001).

The 'andeanist' discourse

The third discourse on water and gender in the Andes that we identify is very influential in on-the-ground water management debates. It claims that the Andean situation cannot be explained by using global frames of reference, but needs to be rooted in local Andean culture and history. In contrast to the 'feminist' discourse, the groups who claim to represent the 'Andean worldview' (the *cosmovisión andina*)⁷ emphasize duality and complementarity as the essential characteristics of the relations between men and women in households. Gender relations in the Andes, according to this view, can best be described and understood in terms of reciprocity and mutual support, as they mirror the dual, balanced and complementary relation between the masculine and the feminine in the mythical worlds of Nature and Deities (e.g. *Pachamama* and the *Apus*, and other sacred symbols and natural beings). "The human community in the Andes cannot be differentiated from nature, and raises its family in harmony with nature" (Grillo 2004: 14). Men and women have different roles and abilities, yet this difference does not signify inequality and subordination which are seen as properties typical of gender relations of occidental (liberal and imperialist) societies. "In modern occidental families there is competition between generations and between the genders. Grandparents, parents and children, men and women, oppose each other in the intense struggle to survive or to maximize benefits. This happens in a similar way as it happens outside the family, in

7 See for instance Grillo, 1994. The discourse is often defended both by the political thoughts of 'indigenism' (represented by non-native intellectuals) and 'indianism' (elaborated by representatives of indigenous peoples themselves). See also Apffel-Marglin and PRATEC, 1998. For analyses of Andeanism, see for instance: Almeida, 1998; Gelles 2000; Mayer, 2002; and Starn, 1991.

society at large, between rich and poor, white and black, etc. ... The family no longer is the environment of love and care, but rather becomes yet another site for profitable investments" (Grillo, 2004:8). In contrast, in Andean peasant families men and women derive dignity and respect from adhering to their culturally assigned roles and places in households and community collectivities. "The objective of the Andean marriage is to form a 'secure' partnership which should have a sustainable union of two opposite elements (man-woman), to form the 'hiwasa' or 'ñuqanchis' as one single indivisible category, the expression of a basic unity on the basis of which complementarity is constructed" (Caceres, 2002:40).

In this Andean worldview, the gender gap in rights to water (and land) is not a cause for concern. Women are ensured of a fair share of resources and incomes through family and community networks. As Grillo argues, "the love and respect our culture attributes to women is beyond doubt. Women are recognized as most valuable in families and communities, and only women can be at the centre of both. The scientific tendency to construct women as individuals is grossly impertinent in the Andes and a direct consequence of the homogenizing effects of imperialism (Grillo 2004:14).⁸ Women do not, as a consequence, need individualized rights to water. Water rights are family rights, and control over water is vested in household and community collectives, rather than in individuals. Whenever gender conflicts occur they are caused by 'outside' influences, such as colonialism, occidental and urban ideologies, national legislation and development interventions. Andean households and communities need to be preserved to offer some measure of protection against such outside threats to gender equity and harmony.

Water security and gender equity

When comparing the three discourses, the similarities between the proposed strategies for change of the 'engineers' and 'andeanists' call the attention. Both 'engineers' and 'andeanists' see no need for women to own property individually, arguing that their membership of household and community collectivities entitles them to the access and benefits of collectively owned properties. Where the engineers' bureaucratic approach simply assumes that all benefits controlled by the household head trickle down to the whole family and disregard all gender issues, andeanists do pay special attention to women's important roles. Their argument is based on fear that granting individualized property rights to women would cause disruptions in families and communities, leading for instance to divorces and internal struggles. The feminist discourse, in its turn, is in favor of supporting

8 According to Grillo (2004:15), one of the founders of the PRATEC group, "...the 'individual woman' is a phenomenon that is specific to imperialism and doesn't have any relevance elsewhere". The construction of women as autonomous individuals is seen by Grillo as requiring the destruction of the human community and all affective relationships, which are then substituted by formal property contracts and forms of social hierarchy and subordination that are hostile to the Andean culture.

individualized rights of women, and proposes changes in the current legal system which would make this possible.

The 'feminist' and the 'andeanist' discourse both counter the more mainstream and hegemonic engineering discourse. The two have rather different opinions about which mechanisms offer greatest water security for women. Where the 'feminist' discourse has greatest faith in the state legal system, the 'andeanist' view believes more in the security offered by family and community collectivities. In current water struggles in Bolivia and Ecuador, many of which have to do with the proposals to privatize water, the 'andeanist' position appears as most popular. Indigenous and peasant water users have little reason to rely on the state to protect their water rights, which is why they often insist on the recognition and protection of their *usos y costumbres* (uses and customs) – a strategy they hope will provide them with the autonomy to decide on their own water questions in their own ways. As Nina Pacari, the leader of CONAIE (Confederación de Nacionalidades Indígenas del Ecuador) and ex-vice president of the Ecuadorian Congress phrased it: "The priority for indígena women is their struggle as communities and not just as women (...). We belong to a community, to a collective entity, which is why the struggle of indígena women is different from that of the women's movement. It is a struggle of peoples in which indígena men and women demand recognition as people, recognition as collective legal subjects (Pacari, 1998:60-6). Accounts of the Bolivian water war likewise show how most women clearly chose to fight for conservation of their collective water rights (Bustamante et al., 2004), and identified the market and the state as threats to their water security.

Gender dimensions of water control

In this section, we present and discuss gendered irrigation realities in the Andes on the basis of a review of a large number of gender and irrigation studies. We start with painting a picture of how mechanisms of acquiring water rights are gendered, a picture that clearly reveals the contours and extent of the gender gap in water in the Andes. We then continue with a description and analysis of how water activities and needs are gendered, a description that serves as a basis for comparison with the three identified discourses. Are water activities and needs clearly divided between men and women, are they complementary (as the 'andeanists' and 'Engineers' would have it), or are they overlapping and sometimes conflicting (as 'feminist' claim)? In what follows, we look more closely at the domains of the household, the fields and the community, respectively, to explore the contents of rights in these domains. The distinction of these three domains serves to recognize that water decisions come about in different social arenas, in which the actors are often not the same. The distinction also helps understanding that water delivery schedules and other agreements that have been formally agreed in meetings of water users' organizations are often different from actual practices in the field. *What is bargained*

about, and what is open to negotiation, may also differ between the field, the household and the water users' organization. Two broad questions guide the exploration. One relates to the importance of water control for women, and for gender equity. How important is water for women, and how important are women for water? The other is about the linkage between formal rights and actual control, and includes the analysis of the determinants of water control in the different domains. In all, the image of gendered irrigation realities that is thus constructed serves as a contrast to the ones produced by the three identified discourses. We use this contrast to further reflect on questions of knowledge, truth, power and politics.

Acquisition of water rights

As was mentioned above, in most known irrigation situations in the Andes, rights to water are registered in the names of men. The different discourses about the linkages between gender and property in the Andes have different interpretations of the significance of such registration. Is registration in the name of men a merely formal, administrative, issue, which in itself does not convey any meaning as regards *who* in a household is endowed with the powers and claims that a right embodies? Or is registration in the names of men a reflection of men's greater control over water? One way of exploring this question is to move beyond mere registration, and study the actual contents of rights in different social domains of interaction. This is the purpose of the next section. In this section, we first pursue the question why it is that titles most often get registered in the names of men. How can people acquire rights to water, and how are the mechanisms for acquiring rights to water gendered? Our answer to this question is based on an inventory of the various possible mechanisms of obtaining rights to water in the Andes (Boelens and Doornbos, 2001; Gerbrandy and Hoogendam, 1998), linked to the evidence provided by a number of gender and irrigation studies.

- *Concession* of water use rights, granted by State administration. Officially, concession of water rights in Andean countries is gender neutral (Vera, 2005a; WALIR 2002). In practice, individual entitlements are granted to 'heads of households', a status which is normally associated with men. Only single, divorced and widowed women who own land thus can acquire water right concessions (Stolen, 1987; Campillo, 1993; Radcliffe, 2000). Official registration of water rights is mostly related to the registration of land titles. Stolen describes on the basis of a study of Caipi in Ecuador, how, when the hacienda was parceled in the 1940s, all land titles were registered in the names of both spouses. The Agrarian Reform Laws of 1964 made this impossible, because land could only be registered in the name of the husband or family head (also see Deere and León, 2001).
- *Historic and socio-territorial rights*. These are rights over water sources originating in or flowing through a geographical territory. The rights are granted to

the inhabitants of this territory ('riparian rights' and 'prior appropriation rights'). Since such rights are mostly granted to communities, recognized membership of a community is crucial. Whether or not women are recognized as members depends on local definitions of community membership.

- *Transfer* of water rights from one right holder to another:
 - *Purchase and sale.* In many Andean peasant communities selling and buying water rights is not allowed or only possible under stringent conditions. This is to avoid accumulation of water rights in the hands of a few people, and to avoid the loss of community control over water allocation. Transactions between right-holders within a community are usually tolerated, particularly among relatives, but often have to be approved by the water users' organization. If selling does occur, both men and women can buy and sell water rights. Gender differences in water trading occur mostly as a result of differences between women and men in their access to capital and markets.
 - *Rental.* Rental of water rights on a semi-permanent basis is a current practice among tenants and sharecroppers. In principle, both men and women can rent water rights in this way, but local customs may differentiate on the basis of gender.
 - *Barter.* Barter refers to semi or non-permanent exchange of resources. For instance, when female farmers do not have access to enough labor for irrigation maintenance and construction activities they may authorize someone else the use of their land- and water rights in exchange for labor, seeds and animal traction and divide the harvest ('*al partir*' or '*trabajar en compañía*').
 - *Donation.* Water rights may also be transferred in the form of a gift. Donating water rights often is an element of alliance building strategies. The gender characteristics of donation depend very much on the context of these social strategies.
 - *Inheritance.* Inheritance rules for water rights vary widely across and even within Andean communities. There are households and communities in which both sons and daughters can inherit water rights. There are also communities that practice patrilineal inheritance of water rights, and there are cases in which subdivision in many small turns or flows is avoided by appointing only one heir who may be either a woman or a man. Virilocal residence patterns upon marriage (see e.g. Carafa, 1993; de la Cadena, 1996) may cause women to lose their inheritance rights when marrying, in favor of their brothers.
 - *Marriage.* Through marriage young couples and their families can get water rights. For poor households without access to land and water, marrying off one of their daughters to a propertied household is one mechanism to obtain some access to water. Such access does often come at a high price for the respective daughter. When daughters move to live with their in-laws, and come to live at some distance from her parental home, they have to do without the social protection from their relatives and friends, making them vulnerable to

exploitation and envy (see e.g. de la Cadena, 1996; Arnold, 1997). Rights acquired through marriage do usually not refer to rights of control, but refer to rights of access. Women often tend to lose such rights upon divorce when they are expected to return to their birthplace communities (cf. de la Cadena, 1996). As Gutiérrez and Cardona (1998:14) describe, there are also instances in which water rights are divided among the genders in case of divorce.

- Acquisition of water rights *by force*. Andean history knows many incidences of water having been expropriated from peasant and indigenous communities by powerful groups (landlords, mining companies, agro-business enterprises) through coercive force. Many of such expropriations have subsequently become legitimized and institutionalized in local power structures. Obviously, both male and female small-holders are affected by such mechanisms of expropriation.
- *User investment*. A very common way in which people have ‘earned’ their water rights in the Andes is by investing their own resources (mostly labor, but also capital, goods and intellectual and organizational inputs) in the construction or rehabilitation of irrigation infrastructure. In some Andean communities the gender division of labor, which is based on notions of men’s greater physical strength and which labels certain tasks as not suitable for women, reduces women’s participation. The very tasks of construction and maintenance of irrigation facilities may be seen as typically masculine tasks that cannot or should not be done by women (Lynch, 1991; Vera 2004; Gutiérrez and Cardona, 1998). In many other cases, as in Cotahuasi-Piro and Quillunza-Huambo, Peru, women are only allowed in *faenas* when they are single, divorced or widows (Meier 2000). If women do provide labor during collective working days (*faenas, mingas*), their contributions may be valued less than those of men (Harris, 1985; de la Cadena, 1985; Lynch, 1991, Tuijelaars de Quitón et al., 1994)⁹ or they may not be counted as their own contributions but as those of the household to which they belong. In the latter case, the water rights are registered in the names of men (Jacome and Krol, 1994). Timing of work parties may further hamper women’s participation for those women who also have domestic and caring duties. The net result is that women often have fewer chances to participate in the creation and maintenance of water rights (See Prins (1996) for an example from Bolivia).¹⁰ There is evidence that gender divisions of labor may change as a result of

9 De la Cadena for instance observed for the case of Pusacpamba, Concepción, Peru, that although the sexual division of labor is considered a complementary one, the valuation of male and female contributions is different: “We have seen how women have to work two days that are counted as one, as if when one would put a monetary value to work female labor counts half as much as male labor” (de la Cadena, 1985).

10 Sometimes, special allowances are made by the community for those persons (e.g. disabled, widows, single mothers) who cannot participate fully in the generation and maintenance of rights. For example, in the community of Marcahuaylla (Mollepata, Peru) some people were exempt from labour contributions while getting water rights in return for other contributions (Boelens and

intermittent or permanent male migration and thus scarcity of male labor. In communities where this is the case, women are often allowed to engage in tasks that were traditionally confined to men.¹¹ Such changes may form the basis of a gradual move towards the acceptance of women as right-holders.

This list suggests that there are a number of reasons to explain why formal registration of water rights in the names of women is less likely to occur than registration in the names of men. Of importance is that water rights in most Andean peasant and indigenous irrigation systems refer and apply to family collectives. Since men are considered heads of these collectives, they are the ones in whose names rights get registered. In theory one could argue, as the 'feminist' discourse does, that registration and recognition in women's own names is important because it provides the legal backup and reference to the different powers and claims that are associated with a water right, and thus makes right-holders less vulnerable in negotiations about water, both in households as well as in communities. Yet, not all women in the studied irrigation systems would agree to the importance of formal rights. In some systems, male-biased registration was seen as merely a matter of conforming to external requirements, whereas 'inside' the system rights were considered as belonging to families or households of which all its members could make use.

Gutiérrez and Cardona describe the case of Combuyo in Bolivia, where water rights continued to be registered in the names of the 'heads of the family' (in most cases a man), in spite of high labor contributions of women to *mingas*. Female irrigators reportedly did not attach much importance to this formal registration, because they conceived of it as a mere administrative issue. According to the authors, irrespective of who appears on the list of formal right-holders, rights are seen to belong to the family as a whole. Some women did even express a preference for registration in the names of men, "because it carries more respect" (Gutiérrez and Cardona, 1998). In the Pungales project in Ecuador, women were likewise not attaching great importance to formal registration. Two female irrigators said: "We consider ourselves as the real right holders, because we have been working since the beginning of the project and everybody knows that we were the ones who have contributed labor. This is why we are the right holders, and he only is a right holder in name." (Jácome and Krol, 1994:26/27) In contrast in Licto, also in Ecuador, women proposed a change in the normal registration procedures so that rights would be registered in the names of both husband and wife, instead of registration

Temminck 1990). In Licto, women successfully negotiated for a 'pregnancy certificate', giving them the right to pregnancy leave without losing water rights (Arroyo and Boelens, 1997).

11 For example, in the Licto system in Ecuador, in a context of male migration and struggle for gender and ethnic emancipation, women's participation in collective labour days for construction and maintenance was valued equally to that of men, and female irrigation leaders were often in charge or organising both male and female workers for those *mingas* (Arroyo and Boelens, 1997, 1998).

of rights only in the names of the 'head of the household' (Arroyo and Boelens, 1997).

Such diverse and sometimes contradictory perceptions of the importance of registration, and of the concept of 'family' or 'household' right, underscore the importance of understanding rights in the context in which they obtain meaning. The ways in which, and in whose names, rights are registered may well be relatively unrelated to local rules of water distribution, which in turn may have little bearing on actual water distribution practices. It is possible that official registration rules that are male-biased get incorporated in the formal regulations of local systems without ever being practiced. It may also be that local rules grant rights to the whole family, while in practice the use of this right is restricted to men. Or formal rights may be vested in women's names without women having the legitimacy and powers at the local level to make use of these rights. All this suggests, in accordance with the conceptualization of water rights proposed in chapter 2, that the actual significance and meaning of rights is not a given but is contingent upon the specific context to which they apply. In both official and local normative frameworks water rights definitions (reference rights) may differ greatly from the ways they are implemented in practice through specific rules, procedures and gendered power relations (activated rights) and in their turn these rules and procedures may lead to unforeseen outcomes for the genders (materialized rights) (cf. F. and K. Von Benda-Beckman, 2000; Boelens and Zwartveen 2002).

It is important to note that registration of rights maybe important not only to protect right-holders' access to water vis-à-vis others within households and communities, but also because it opens up spaces and possibilities for irrigation related powers at higher levels. One such level is the level of the community or entire irrigation system; the right to participate in decision making and voting and the right to occupy leadership posts in the irrigation system are often conditional upon registered membership of the irrigators' organization. Secondly, and often even more important especially in times of liberalization and privatization¹², formal rights convey visibility and legitimacy in the eyes of 'outsiders' (NGOs, state agencies and banks). In many Andean communities, (intermittent) migration has led to the reduction of male involvement in irrigation at field level. This is why the field tasks of irrigation have increasingly become the work and domain of women, with the result that also intra-household struggles over water have become less. In the analysis of Lynch, men have willingly delegated their water responsibilities and powers to women, and water control at household level has become less important

12 Some scholars see a process of 'glocalization', in which the local is increasingly connected to the global, with the level of national bureaucratic administration becoming less important (Swyngedouw, 1997; Assies 2003). There is quite some debate as to whether such a process is indeed happening. What remains pertinent to many Andean peasant irrigation systems is that, through incorporation in markets and different administrative systems, some decision making powers get externalized and come to lie with 'outside' actors, such as banks, courts and other state agencies, or NGOs.

in reproducing gender inequities. Instead, gendered water struggles now increasingly occur around attempts at influencing irrigation decision making at community and supra-community levels, and around access to 'outside' sources of support for irrigation rehabilitation (Lynch, 1991:45-46).

If this analysis is correct, it implies that the importance of formal registration cannot be assessed just on the basis of gender based differences in water control in the fields, but needs to be linked to larger questions of political authority, visibility and power. Often, the irrigation organization is one of the most important community based organizations. These organizations are important gateways to outside resources and power alliances. When traditional communities increasingly come to depend on such outside resources and alliances for their survival, the visibility, presence and participation of women in organizations that represent the community in wider political and economic networks becomes more important. Lists of registered right holders also often form the starting point for targeting government or NGO assistance, information and other resources. Where male-biased registration initially carried little significance for actual water decisions inside the irrigation system, this may change when irrigation communities become more connected, politically and economically, to supra-community administrative structures and markets.

Gendered water responsibilities and needs

Are water activities and needs clearly divided between men and women, are they complementary (as the 'andeanists' and 'Engineers' would have it, or are they overlapping and sometimes conflicting (as 'Feminists' claim)? These questions cannot be answered in a very straightforward manner, because the Andean region represents a wide variation of household forms and types, and of ways of organizing and dividing irrigation responsibilities and powers. Also, irrigation realities often do not display a very sharp distinction between masculine and feminine responsibilities and identities. Irrigation needs and interests, therefore, are likely not to be very clearly gender specific or segregated. Anthropological studies of the Andes provide further evidence to reject portrayal of the Andean irrigation world in neat gender dichotomous terms. There are communities where not just nature, but also humans can have more than one gender, and in which men can have feminine roles, just as women can have masculine ones.¹³ Such evidence shows that there is no *necessary* relation between a person's bodily characteristics and that person's gender.

13 Rösing for instance shows how in the community of Amarete (Bolivia), the symbolic gender of one's field partly determines the actual gender of the owner. Thus, "a woman who owns a double masculine plot is, in line with her symbolic gender, called a wachu or sayaña, a man-man". The same is true for men, who may have feminine or double feminine genders. In total not two but ten genders are distinguished and divided over the biological sexes. Female genders have a lower status and less liberty than male ones, affecting biological men as well as women with female genders. See Rösing, 1997.

What most studied cases have in common is that, even though not all household members equally contribute to or share from it, the production of irrigated crops is not normally considered an individual enterprise of one household member. Instead, it is seen as a joint responsibility of all household members, men and women, a responsibility that fits within the larger shared goal of household survival and that is part of a household livelihood strategy that often contains more elements in addition to irrigated agriculture. In this respect men and women belonging to the same household in general do not have conflicting irrigation interests or needs: both are interested to optimize the allocation of available household labor and resources to irrigation so as to produce a good harvest. Intra-household struggles over irrigation water are not common, and if they occur they are often linked to or the result of larger conflicts between household members rather than originating in water per se (see Krol, 1994).¹⁴

Something that has fuelled and continues to inform ideas that irrigation belongs to the domain of men is that the tasks of canal maintenance and water distribution used to be (and sometimes still are) labeled as strictly masculine (Bourque and Warren, 1981; Lynch, 1991; Radcliffe, 1986; Tuijtelaar de Quitón et al, 1994). Such labeling was often reinforced and reproduced by outside interventionists adhering to the 'engineering' discourse (Ahlens and Smits, 1991; Krol, 1994). Especially the difficult task of making *canteros* - the typical spiral-shaped Andean irrigation furrows that wind down slopes - used to be considered as something that can and should only be done by men (Jácome and Krol, 1994). Radcliffe even reports about an irrigation area in Cuzco that the exclusion of women from the use of the plough and from irrigation was reinforced by taboos and myths illustrating the danger involved if women were to participate in these labors. Irrigation was seen to potentially threaten women's fertility due to contact with water (Radcliffe, 1986). Across the Andes more generally, gender divisions of labor in irrigation that confine women to using the water in the fields and applying it to plants, and make men responsible for making sure that water gets to the fields often tend to be couched in larger mythical narratives with clear sexual connotations: when women's fields are 'dry', men are needed to make them wet and fertile again. In addition to such symbolisms, physical strength is also an often referred to justification for labeling certain irrigation tasks as masculine. In Combuyo, Bolivia, some people said: "We don't see how women can replace men in these works, because we do not value their labor equally, because there is a difference, women do not work the same as men, they work less" (cited in: Gutiérrez and Cardona, 1998:8).

The rather strong association of irrigation with masculinity does nevertheless not (or maybe no longer) guide the actual organization of irrigation activities and responsibilities in many systems. Those studies that include observation of actual irrigation practices invariably report involvement of both men and women in

¹⁴ The absence of struggles cannot be taken to imply that there is intra-household justice or equity. See also Agarwal, 1994.

irrigation and irrigated agriculture (Lynch, 1991; Tuitelaar de Quitón et al., 1994; Gutiérrez and Cardona, 1998; Jácome and Krol, 1994; Vattuone et al., 1996). The very task of irrigating the crops in the fields, as some studies report, often requires the presence of more than one person. One or more persons guard the water, making sure that it is not taken by someone else. Others guide it from the intake through the furrows. Men and women often collaborate in carrying out these tasks (Bunker and Seligmann, 1986; Tuitelaar de Quitón et al., 1996; Gutiérrez and Cardona, 1998). Studies also show that both men and women possess irrigation knowledge. They know the rotation schedules and the timing of their turns, they know how to guide water to their fields and they know how to close the different outlets (Jácome and Krol, 1994; Gutiérrez and Cardona, 1998; Arroyo and Boelens, 1997 and 1998). In Bolivian irrigation communities, children (girls as well as boys) at the age of five already know how to irrigate. When they are eleven, they understand how water is distributed and scheduled within the community (Gutiérrez and Cardona, 1998a:21).

Male migration is one important reason why prevailing denominations of certain types of activities as strictly masculine start losing their significance. While the 'feminine' tasks of caring and cooking continue to be done by women, women also increasingly become responsible, and get involved in, those tasks that used to be seen as strictly masculine. Another effect of male migration is the reduction of the total amount of 'hands' available as a result of which the logistical organization of the different tasks in the fields, offices and homes becomes more difficult. The care for small children, for instance, is an activity that is typically difficult to combine with agricultural and irrigation tasks, especially if the canals and the fields are located at some distance from the home (Deere and León, 1987; Lynch, 1991; Vokral, 1991; Ahlers and Smits, 1991; Jácome and Krol, 1994). In Pungal, Ecuador, women often took their small children along whenever they had to go somewhere, including to the fields and to meetings. They breastfed the children, and changed their diapers at these very locations. One woman explained: "It is a problem with the small children, I do not have anyone with whom I can leave them, but I have to irrigate. Sometimes I have to take the child along, and I carry him while irrigating" (cited in Jácome and Krol, 1994:42).

What determines the level and degree of household members' involvement in irrigation and irrigated agriculture is primarily their physical availability. Women's availability is partly a function of their caring tasks: with small children to look after, it becomes more difficult to organize work in the fields or guard the canals. Men's availability, as referred to above, often depends on whether and for how long they have jobs outside of the village. Involvement in irrigation and agriculture also depends on whether there is enough cash, to replace family labor by hired labor. Deere and León's analysis probably still holds true today: Women's greatest agricultural participation, relative to men, is found among the poorest strata of the peasantry, those without sufficient access to land to produce their full subsistence requirements, and among those households where the man works full time in wage labor (Deere and León, 1987:311-312).

In all, gender is not a major or first determinant of irrigation water interests, as men and women as couples or family-members often share similar irrigation goals. If irrigation responsibilities in the field are gendered, this is most likely to be the result of male migration rather than of ideologically inspired gendered divisions of labor, or of the designation of tasks according to gender. This is not to deny that there may be gender-based differences in preferences for how the system is operated and how water is distributed. Three such differences are frequently referred to in studies:

1. Women are often interested in being able to use irrigation facilities for other purposes than just irrigating the main crops: e.g. washing clothes, watering vegetable gardens, revitalizing nearby bushes for feeding animals and firewood gathering, or bathing children. The proximity of irrigation canals to their houses makes irrigation systems a much more attractive source of water as compared to other sources (Bastidas, 1999 and 2004; Lynch, 1991; Vattuone et al., 1996; Tuijtelaars de Quitón et al., 1994; Vera, 2004). In communities that lack (sufficient, reliable and clean) drinking water, women – as the ones responsible for drinking water provision – are usually among the first to recognize the potential of irrigation systems for satisfying domestic water needs. A woman in Ecuador explained: “This is the third time during this week that I have to come to the canal to get water for the house. Although we have the installations for tap water, the system never works. (...) I also come to wash my clothes here and sometimes my children come with me to take baths in the canal.” (Bastidas, 1999:8). The use of irrigation water for such purposes places specific demands on the quantity, quality, and spatial location of accessed water.¹⁵ Vera describes how an irrigation design that came about after consultations with only men prevented the continued flow of water to the waterholes customarily used by women for watering their livestock. Women’s protests led to a redefinition of the project for it to include a watering place for cattle, and a drinking water system close to the houses (Vera, 2004:113).
2. Women and men may also have different preferences for the operation and scheduling of irrigation water deliveries, which is primarily due to the lesser flexibility of women in terms of time because of their domestic workloads (cf. Jácome and Krol, 1994). They for instance have to prepare meals at fixed times of the day. Hendriks reports how such gender differences made women prefer a continuous flow of water close to their homes, whereas men preferred non-

¹⁵ Many ‘irrigation and gender’ studies have used such other uses of irrigation systems by women to establish that women’s water requirements are ‘different’ from those of men. We are less convinced of such difference, partly because many men use irrigation water for other than the designated uses as well: washing clothes and utensils, watering and washing animals, making bricks and so on. The urge to label such uses as different and pertaining to women is likely to stem more from its anticipated political effect in establishing women as deserving the attention of the irrigation profession, than from any strong correlation between gender and types of water use.

permanent rotational turns that would allow them to irrigate with a larger flow in less time (Hendriks, 2002).

3. Many studies also report that women would prefer to avoid night irrigation (Van der Pol, 1992; Ahlers and Smits, 1991; Krol, 1994; Bastidas, 2004). They fear gender-based violence when they have to go out at night to irrigate, while irrigation at night also reflects negatively on their social status as a woman and may arouse a husband's jealousy and anger. Night irrigation is often also difficult to combine with the care of small children (see Jácome and Krol, 1994:47; Arroyo and Boelens, 1998:110-111). A female irrigator in Yurraccraccay in Peru said: "I do not like to irrigate at night. It is very dangerous for women, because men are drinking during the night and walk around harassing women (Ooijevaar and Van Reedt Dortland, 2003). Women also, possible more than men,¹⁶ find it practically more difficult to irrigate at night. They are reported to find it hard to avoid stealing by others, and face problems of water application and soil erosion because of the dark (Pol, van der, 1992; Ahlers and Smits, 1991; Jácome and Krol, 1994; Ooijevaar and Van Reedt Dortland, 2003; Tuijelaars de Quitón et al., 1994). In spite of their reluctance to irrigate at night, women (just as men) do realize that night irrigation is sometimes unavoidable with a rotational irrigation schedule, and they do go out at night to water their fields when it is their turn.

This list suggests that women, just as men, have clear opinions about the technical and operational requirements of an irrigation system. Sometimes their ideas and needs are different from those of male household members, but mostly they are complementary in the sense that they are derived from women's responsibilities as (co-) farmers of irrigated fields. They may nevertheless clash or be in conflict to those of other irrigators, men or women. This, in combination with the fact that as many or more women work in irrigated fields and contribute to system maintenance tasks as men, makes it pertinent to further explore their possibilities of controlling water: given their water responsibilities, women need security of water tenure and control as much – and sometimes even more – than men do.

The household

Since water rights usually refer to families or households, the use of a water right is partly determined and established within the domain of the household. It is one domain in which the reference rights to water obtain significance and meaning. How water is used, for which crops, how irrigation tasks and costs are divided and how benefits derived from the use of water are shared are all decisions that largely are taken within this domain. It is, in other words, partly within the domain of the

¹⁶ The difficulty for women to irrigate at night is reported and emphasized in many 'gender and irrigation' studies. In most of those, men's feelings and opinions about night irrigation are not reported. There might, therefore, be a researchers' bias here, provoked by the wish (again) to establish the need for gender-specific irrigation attention.

household that a large part of the contents of a water right are determined. The assessment of whether this happens in a more or less 'fair' way is related to the broader question of how to conceive of households. Can households be described as more or less harmonious entities, as adherents to the andeanist discourse tend to do, just as engineers? Or should the idea of households altogether be abandoned for attention to focus on individuals, which is the vision of some feminists and neo-liberal thinkers? If the first view applies, then the idea of individualized access rights to water (either for men or for women) seems of little practical value, but if the other view is more valid, the fact that only men are vested with formal rights might mean that it is more difficult for women to meet their irrigation needs.

In the previous section it was already established that men and women belonging to the same household in general do not have conflicting irrigation interests or needs: both are interested to optimize the allocation of available household labor and resources to irrigation so as to produce a good harvest. Potentially, intra-household conflicts or disagreements could be expected to occur over labor and other investments in irrigation related activities, or over how the proceeds of irrigated farming are to be shared or spend. Such potential conflicts could for instance take the form of disagreements about cropping or technology choices. The different studies do not make mention of such conflicts, which may be taken to mean that they are not frequent. The studies that do report incidences of intra-household disagreements over farming and irrigation matters (Harris, 1985; Carafa, 1993 and Vokral, 1991), show that these are the result, rather than the cause, of wider conflicts between family members. The only issues about which intra-household conflicts are reported relate to the selling or renting out of water rights and to the question of what would happen to the family's water rights in case of divorce. Such disagreements may not directly be about water, but often take the form of disputes over irrigated land. There are known cases of husbands selling land rights against the wishes of their wives (Stolen, 1997). Women, especially when their relations with their family-in-law are not very good, often fear that they will remain without any sources of income and food when their husbands leave or die. Krol for instance describes a fight between a husband and a wife about how to divide the irrigated lands after they separated. The husband claimed the lands that were easiest to irrigate for himself (Krol, 1994:44). The same study also tells the story of Narcisa, who felt insecure about her future water entitlements because her rights were registered in the names of her parents-in-law.

The different studies show how the intra-household division of irrigation responsibilities often more or less corresponds to the division of decision making powers inside the household (cf. Jácome and Krol, 1994). Those who irrigate are often also the ones to decide about it, at least in the domain of the household. This is how Jácome and Krol describe intra-household decision making in Pungales, Ecuador: "Irrigation is usually decided by the husband. When he is around, he takes the lead, even when he has been away for a long time. The wife then loses her autonomy and can either argue with her husband's decisions, or simply accept them.

In the case of Mercedes and Pancho, she does not mind that Pancho takes over when he is around, because he also takes over a lot of work. Juana relies on her father for making irrigation decisions. When she wants to irrigate, she has to wait until her father has finished. In the case of Nela and Alfredo, it is Nela who has a lot of influence in field irrigation decisions and Alfredo who often questions her opinions." (Jácome and Krol, 1994:42)

Complicating the question of intra-household water negotiations is the large variety in types of households. The studies illustrate that the 'family' is associated with multiple forms of kin and non-kin interdependencies. Jácome and Krol, for instance, distinguish 4 types of households in their study location in Ecuador: households headed by women, households of migrating men, nuclear households and households of single men. Only 36% of the households in their study area were of the nuclear type.¹⁷ Bastidas – in her study in a different area in Ecuador – distinguishes between households on the basis of how much time women need to spend on the care of small children. Hence, in households with children under age 13, "women spent most of their time in reproduction activities, such as taking care of the children, cooking, cleaning and washing clothes" (Bastidas, 2004:160). Important in shaping work divisions are the composition of households and the intra-household organization of work and responsibilities in relation to the overall household livelihood strategy (Lynch, 1991; Deere and León, 1987; Gutiérrez and Cardona, 1998; Jácome and Krol, 1994; Vattuone et al., 1996; Bastidas, 2004).

What is maybe as important as realizing how many different types of households there are, is that it is often not all that easy to determine what constitutes 'a household'. In many Andean realities, household boundaries are fuzzy and constantly changing, depending on shifting alliances and needs (Weismantel, 1989). Kinship-based networks of mutual support often stretch beyond the household, such as when a daughter living with her mother also works on the fields of her father and often cooks for him as well (cf. Krol, 1994). Migration of men from rural areas to cities and to foreign countries is a widespread phenomenon that impacts greatly on the composition of households, as well as on the ways in which people organize activities and livelihoods. It also further complicates the drawing of household boundaries. Easy definitions of households that are often used for pragmatic purposes such as 'eating together' or 'sleeping under the same roof' are no longer applicable when one or two members eat and sleep elsewhere for longer periods of time. Sharing the same purse, which is also sometimes used, is equally unclear because of the assumptions of equal sharing and access on which it tends to rest.

The fuzziness of the boundaries between households implies that it requires "social and cultural work to affirm its existence [...]. The independent household needs to be constructed and asserted in every moment, at every step, and with every activity..." (Mayer 2002: 8) In fact, what a household is and who belongs to it is

¹⁷ Across Latin America as a whole the nuclear family form accounts for at most 50% of households in a region (Molyneux, 2002:184).

often an intrinsic part of negotiations about the contents of water rights: the affirmation (consolidation) of water rights not only requires the continuous re-affirmation of the rights themselves but also the re-affirmation of the household to which the rights are linked (this is when someone claims access to water on the basis of belonging to the same household as a person with registered rights). Hence, allocation of land and water rights to households in a community is a process in which also household boundaries need to be negotiated and established. What is at stake in such negotiations is how many people can make use of the water, and how many can be called upon to contribute to system maintenance.

In all, the reviewed evidence provides considerable justification for rejecting the unitary, 'harmonious' household model, without altogether rejecting some notion of collectivity. Household members cannot be conceived of as free agents that pursue their individual goals in depersonalized ways. Some household collectivity and 'togetherness' does exist and belonging to a household has a clear significance for their members. Household members are bound by ties of affection, kinship solidarity, mutual protection and collaboration. Each household displays different ways of interaction between members. Yet, household members do not always have shared objectives, and may negotiate and bargain with each other in order to realize their interests and impose their authority, even when conflict minimization continues to play a fundamental role. The very boundaries and constitution of households may be at stake in such negotiations. This balance, between collective and personal interests and between individual claims and mutual solidarity, is shaped, as Mayer (2002:10) observes by a framework of culturally prescribed normative roles, to which a person should conform but also sometimes may radically challenge at the risk of being labeled deviant.

Not all household members are equally well positioned to defend their needs and interests. The major importance of water rights at the household level may well be that it co-determines a person's abilities and powers to bargain. Where the fact that women do not normally have rights in their names does not seem to affect their direct water access much, it may well be weakening their overall intra-household bargaining position. The insecurity about whether or not they will obtain a share of the household resources (land and water, most importantly) in case of divorce may make women reluctant to question their husbands, or start fights with them. Women's fall-back position, in other words, their outside options that determine how well-off they would be if cooperation failed, is often much weaker than that of men. The fact that water rights are registered in men's names is one factor that contributes to this weakness. Other important factors include men's generally stronger rights in land (Deere and Léon, 2001) and their higher chances and possibilities of finding paid employment (see Sen, 1990).¹⁸ Together, they make that the ability of men to physically survive outside the household is far greater, which in

¹⁸ Also see Agarwal, 1997 for an elaborate discussion of what determines bargaining power in intra-household decision making processes.

turn increases men's bargaining power within the household. The many reported incidences of sometimes extreme domestic violence, men beating up their wives and children especially when they are drunk, can be taken as an indicator of this:¹⁹ if women would have been less dependent on their husbands, it would have been easier for them to leave.

The fields

We have identified 'the fields' and 'the water users' organization' (or 'the community') as two other domains in which water rights obtain meaning. The fields are the place where water flows from the canals of the irrigation system to the plots and the crops. The 'fields' also include the canals that need to be maintained. It is one place where water rights, as it were, get materialized. In the field, irrigators meet with their field-neighbors and often make more or less formal arrangements to divide the water, operate the division boxes and guard the canals when irrigating. The 'community' or water users' organization is the more formalized management organization that is responsible for irrigation management. Following Agarwal, three types of inherent conflict around which irrigation related struggles and bargaining are likely to occur in the field and the organization are (1) over the distribution of water (in relation to contributions to maintenance and system improvements); (2) over positions of political power and decision making authority; and (3) over community norms that dictate *social* behavior (cf. Agarwal, 1997a:48). It is likely that the direct water distribution questions, as well as those related to contributions to maintenance, are (at least partly) settled in the fields, through direct interactions and meetings between irrigators who know each other. Decisions and negotiations that have more to do with the defense of community water rights vis-à-vis other communities, or with claiming of 'outside' resources for the community, are more likely to take place in the formal water management domain. Crop choices and decisions that have to do with agricultural strategies are, in contrast, mostly taken within households.

In fact, the general picture that emerges from the various gender and irrigation studies in the Andes is that the degree of female control of irrigation decreases the further one moves upstream from the farm inlet to the main intake of the irrigation system. Women may have quite some influence on decisions relating to on-farm water applications, decisions that are taken with household or family members. Their influence in water distribution and operation at intermediate levels, in 'the fields' may still be quite substantial, although women often have very little say in decisions about system construction and maintenance. As for the management at the level of the entire system, here female involvement is most limited. There are, for

¹⁹ Krol reports this in her study (Krol, 1994). Other studies documenting male violence against and abuse of women include de la Cadena, 1996 and Francke, 1993.

instance, very few women who occupy leadership posts in water users' organizations (Lynch, 1991; Krol, 1994; Gutiérrez and Cardona, 1998).

As also mentioned in the previous chapter, populist 'feminist' discourses tend to construct such evidence as a symptom of women's lesser water powers and possibilities of controlling water. However, some doubts about whether increasing women's participation in formal organizations would also increase their control over water seem warranted. For one, the studies that have looked at what happens in meetings show that women, even when they are present, do not as actively contribute to the discussions as men, and sometimes even remain completely silent (Krol, 1994; Gutiérrez and Cardona, 1998). Women often feel ill at ease in meetings, which is why they themselves may prefer to be represented by husbands or sons. This is why Gutiérrez and Cardona, on the basis of a study of irrigation systems in Bolivia, attach little importance to women's visible presence and participation in water users' meetings. According to their analysis, women do exert influence in communal water decisions, because men always consult with them before an agreement is reached (Gutiérrez and Cardona, 1998:59).

There may also be other reasons why women themselves are not all that interested in participating in meetings. In the Bolivian irrigation systems studied by Gutiérrez and Cardona, women felt reluctant to leave aside their more important agricultural and domestic works for the sake of attending meetings. They considered such meetings a waste of their time. Some women were even critical of their husbands spending so much time in them, time that they could have more profitably spend on productive activities. One woman who did attend meetings (as a compulsory requirement to keep her water right) complained: "(...) the only thing I do when I am at a meeting is to listen, or I fall asleep. I only go because I have to. Instead of attending the meeting, I could have combed my hair" (Gutiérrez and Cardona, 1998:31-33). Other studies also document that not all women are particularly keen on getting involved in users' organizations. Bastidas explored women's absence from the water users' organization in Carchi, Ecuador. Her study showed that for women with small children, time was a major constraint. When children grew older, however, most women still preferred their husbands or sons to attend meetings instead of them. Not just ideology, but also the fact that these women could earn some individually controlled income explained this. Women thought that directly productive activities were a more rewarding use of their time (Bastidas, 2004).

Such evidence suggests that women do not always feel they need the organization to address their water concerns. This may either be because their needs are well represented by men or because of their reluctance and hesitation to enter into a 'masculine' domain. It may, however, also be related to the fact that many of the decisions about water distribution and labor mobilization that directly matter to them do not (just) come about in the formal meetings and through the formal organization, but are instead taken and negotiated in the domain of 'the fields' (or in other domains). The few studies that document how actual water distribution and

labor mobilization come about in 'the fields' provide some support to this hypothesis. Krol for instance shows how actual irrigation patterns often completely differed from the rotational schedules that had been agreed upon in water users' meetings. Actual irrigation practices were as much determined by personal considerations such as how much time people had available, and by agreements between neighbors and friends about sharing or exchanging water turns, as they were the result of formal negotiations and agreements (Krol, 1994). Krol's study documents how one woman almost single-handedly adapted the irrigation rotation schedule, in response to requests from neighbors and friends who did not understand it or who found it difficult to irrigate at the times designated to them. On-going research of Juana Vera Delgado in the Andes of Peru likewise shows how many important water distribution decisions are taken in so-called *reginas* where irrigators meet with the canal operator (*regidor*) to request water. Every day between four and seven o' clock in the morning, thirty or forty water users assemble in this way around the operator to demand their water share. The operator makes use of these assemblies to also discuss other problems and issues that have to do with the operation and performance of the system. Both women and men are present in these meetings, unlike in the more formal meetings of the water users' organization which mostly gathers men and where women do not like to go (Vera, 2005b).

It is possible that the continued designation and reification of the formal water users' organization as a masculine domain, and as *the* place where water decisions come about, has gradually resulted in a separation between the actual irrigation work in the fields (which are increasingly done by women), and the (increasingly formalized) management tasks (done by men) that happen in meeting places. How outside interventions may shape such a process is neatly described by Vera Delgado in her analysis of an irrigation project. She shows how the self-esteem of male landholders was boosted through their participation in trainings, interactions with irrigation project engineers and other technical staff. Her analysis suggests that the appointment by outside interveners of men as the community spokespersons and decision-makers reproduced or generated a gender division of labor, with men becoming increasingly responsible for dealing with 'the outside world', and women becoming increasingly responsible for the physical works of farming and irrigation in addition to their domestic tasks. That the women of Llullucha were afraid to speak in community assemblies even when invited to do so was not just a reflection of a prevailing division of tasks, but also the direct result of years of exclusive project attention to, and training investments in men (Vera Delgado, 2004:118).

The water users' organization

One possible result of the separation between meetings and fields is that what happens in the field is less and less related to what has been decided in the organization. What gets discussed in water users' organization's meetings may relate more to linkages between the community and 'the outside' world, and revolve

for instance around strategies for obtaining sources of support from government and donor agencies, than being about water management 'inside' the community. Coming together and discussing things in meetings may even gradually obtain an almost ritual and symbolic meaning in re-confirming masculinity and power. It continues to reflect an ideological separation of the world in a male public sphere and a female private sphere, even though the boundaries of these two spheres seem to have shifted over the years.

Men, as household heads or as formal land-right holders, are considered the 'logical' representatives of households in irrigators' meetings. This has to do with the fact that the characteristics that are associated with successful performance in meetings are more readily associated with men than with women. To be outspoken and clearly articulating arguments in public are qualities that are evaluated positively when found in men (Rens, 1992; Carafa, 1993), but when found in women they may reflect negatively on their social status *as women*. In Pungales in Ecuador, women explained that they felt reluctant to voice their concerns in meetings because they were afraid of making mistakes and being ridiculed. They felt they lacked the rights credentials in terms of experience and knowledge to phrase and articulate their opinions (Krol, 1994). A woman in the Peruvian Lullucha community in Paucartambo likewise commented: "We are too shy and too afraid to voice our ideas about water management in community meetings; sometimes we talk to our husbands, but we do not have experience in talking to outsiders". Men from the same community added: "Lullucha women do not have any experience in public meetings, and they cannot talk in public. Women lack character in making decisions, and most are shy and illiterate." (cited in Vera Delgado, 2004:109 and 119). In Combuyo, Bolivia, although many members of the water users' organization were women, women were not deemed qualified to occupy the post of water judge. They would not wield the same amount of respect as men, and "the character of women is too explosive to harmoniously solve water disputes" (Gutierrez and Cardona, 1998a).

Men are not just seen to be 'naturally' better in public meetings, they also have generally enjoyed more education, and through their experiences 'outside' the community such as in the army and in migratory labor they have gained knowledge that strengthens their own and others' confidence in their capacities as decision makers and managers. Ideological beliefs that women are less suited and inclined to deliberate and discuss matters in public are similarly reinforced and sustained by women's lower literacy levels and by the fact that more women than men do not speak Spanish. Yet, in spite of such constraints, male migration makes it ever more difficult to designate the formal and institutionalized irrigation politics to men only. The number of men who are physically present and available to become involved in irrigation management tasks is decreasing rapidly in many communities. As one solution, water meetings are sometimes planned during week-ends, when at least some of the men are around. There are also an increasing number of irrigation systems in which women have started claiming the rights to participate in water

decision making, and the rights to become water leaders. Van Drunen, who worked for the past 20 years with peasant and indigenous irrigation organizations in Ecuador, for instance observed how much more common it has become to come across female leaders: "Although it is not a generalized situation, there are many irrigation system now in which women can be seen to be real members and leaders" (Van Drunen, 2000).

Because of how formal water users' organizations have come to be defined as masculine domains, and because successful performance in these domains has come to be associated with masculinity, becoming accepted as members and leaders is not a smooth and easy process for women. It involves a re-valorization and re-definition of female identity and work and a rejection of rules and regulations that tie women to specific roles. In this process (and struggle), women may have to sacrifice traditional forms of respect and protection. Typically, the sexual integrity and moral virtues of women who occupy public spaces previously reserved for men are questioned. They are accused of being 'public women', and risk physical and verbal abuse because of it (Arroyo and Boelens, 1997 and 1998). The most detailed illustration of what this entails is provided by Arroyo and Boelens in their analyses of the Licto irrigation scheme. The rise of indígena women as irrigation leaders generated strong resistance, especially from the wealthier male mestizo farmers. Inés Chapi, one of these female leaders, recounts:

"We [the women who got together and organized themselves] were told that our children were not from our husbands, that they were children from 'gringos', and the priest told me that we were Negroes. To our husbands they said: "Listen, you are dummies, you have to take off your trousers, your wife does such and such things". In the mass in church, people were told not to associate with me and Rosa, that we were bad women leading bad lives." (Cited in Arroyo and Boelens, 1997:66)

Rosa Guaman, another of the leaders, relates similar incidences of abuse:

"They told us: 'those mannish women that do not obey their husbands, they do not respect their homes or the cross of God". Then they said to us that we were like men, that's what we really came under fire for, because I began to involve myself in something different, very different from what my mother had done." (Cited in Arroyo and Boelens, 1998:400)

The comments of Inés and Rosa illustrate how not just women, but also their husbands lost respect when their wives assume positions of authority in the community. They risked being considered as 'weak' or 'effeminate' men who could not take care of their own business but instead needed to send their wives (see also Gutiérrez and Cardona, 1994a:33). Similar experiences were registered in Corporaque, in Peru, where women who expressed the ambition to become registered as water-right holders and to join meetings were referred to as 'machista' by others. To be called 'machista' means being seen as a woman who is dominating and impulsive, someone who calls the shots and tells her husband what to do, and someone who takes decisions without consulting her husband. She is, in short, seen

as a person who does whatever she wants without respecting the familial and social order (Vera Delgado, 2005).

Such accounts of women's attempts at obtaining a greater voice in irrigation-related decisions show how water control is not just a struggle about resources, but also and importantly a struggle about norms, meanings and identities. Women who would like to occupy formal positions in organizations have to be able to justify this aspiration by actively constructing counter-discourses and alternative interpretations to those gender ideologies that preach their inferiority or that limit their powers to the 'private' domain. Paradoxically, those communities where the emerging need for greater female participation in water users' organization is highest (i.e. communities with high male migration) are often also the communities that face a stronger influence of white mestizo, urban, machismo with its strong middle class ideology that a woman's place is in the home (*marianismo*).²⁰ The *machismo-marianismo* model reduces the discursive and normative legitimacy of more formal female representation in users' organizations. In Licto, women justified their attempts to participate more actively in water users' organizations by presenting such roles as logical extensions of their accepted roles as mothers and wives. They also strategically 'shopped around' in and 'borrowed' elements from 'educación popular' inspired discourses in legitimizing their breaking with traditional gender roles (Arroyo and Boelens, 1997 and 1998).

The experience of the Licto women is telling also because of *why* they became interested in becoming more formally involved in the organization. A very important reason was that in the absence of their husbands, formal membership would give them the power to deal and negotiate not only with other irrigators within the irrigators' association, but also with state agencies and other 'external' agents (Arroyo and Boelens, 1997:128-129). This illustrates that the importance of rights and formal membership may lie not so much, or not only, in the protection of right-holders' access to water vis-à-vis others within households and communities, but more – or also – in its opening up of spaces and possibilities for irrigation related powers at higher levels. Membership rights convey visibility and legitimacy in the eyes of 'outsiders' (NGOs, state agencies and banks). Local irrigation leaders often are or become important spokespersons for such 'outsiders', and derive an important part of their powers and legitimacy from their abilities in channeling outside resources to the community. They are also, and probably increasingly so, important in protecting the water rights of their community towards threats from outside, such as those created by new neo-liberal water laws.

20 The general discourses of machismo and marianismo have local and rural adaptations. In migrant communities in the Andes it is quite common to portray women as the 'carriers and defenders of culture' and men as 'carriers of modern styles of production and knowledge' (de la Cadena, 1996; Radcliffe, 2000). Such portrayal carries normative associations. Traditional culture, although simultaneously glorified, is also identified with backwardness. Modernity and knowledge, although criticized, are associated with progress.

Discourses, truth and politics

In this last and concluding section of this chapter, we discuss the presented evidence against the light of the described discourses, focusing on the two critical ones: the 'feminist' and the 'andeanist' discourses. As explained in the introduction, the ultimate aim of this discussion is to explore how well the conceptual abstractions of the two discourses serve the purpose of establishing the visibility and legitimacy of women as irrigation subjects – or of gender as an irrigation concern – which is the larger theme of this thesis. Both discourses have shortcomings in terms of how well they correspond to actual gender and irrigation realities, but both not just serve the purpose of representing such realities. They are also used to lend legitimacy to feminist and andeanist struggles. In all, the ways in which the two counter-discourses to the mainstream 'engineering' one frame women's subjectivity offer little possibilities for their agency and power. Our concluding argument of the chapter is that any analysis of gender and irrigation realities which seeks to identify potential spaces for feminist thinking and action, or which seeks to extend visibility and legitimacy to women as subjects, should link to real ongoing struggles and include a critical perspective on the discourses and knowledge employed. We suggest that important possibilities for feminist thinking and action may well lie in the very co-existence of more than one discourse.

Representing gendered irrigation realities

A first identified weakness of the two discourses relates to their conceptualization of 'collectivities' and gender relations. Where the Andean worldview tends towards a rather idealized account of family and community collectivities, and sees gender relations as primarily harmonious, the 'feminist' discourse tends to mark families and communities as key sites of gender struggle and conceives of gender relations as antagonistic and conflicting. The evidence presented above clearly shows the limitations of both views. Gender relations are neither solely harmonious nor antagonistic, but involve common interests as well as conflicting ones, emotional dependencies alongside economic support. Women and men precariously balance personal with collective needs and interests in their households and communities, simultaneously legitimizing and contesting inequalities.

Household and community collectivities cannot be taken as symbols and manifestations of harmony and solidarity, but approaching them as the primary sites of gender oppression is equally erroneous. Collective ownership of water and irrigation systems does exist, and provides an important backbone and *raison d'être* for many indigenous and peasant communities. There is even quite some evidence to support the belief that such collective ownership that is rooted in community norms and rules, and reproduced in everyday practices and negotiations, provides a measure of protection against male-biased state legislation or other 'outside' threats

to water security. At community level, and in the fields, women tend to be recognized and accepted as legitimate users of water, provided they comply with the responsibilities that go accompanied with this right. They acquire such rights precisely because - and if - they are recognized and respected as members of households and communities. Such recognition and respect comes with normative judgments about *who* can be considered members, judgments that are linked to how the boundaries of families, households and communities are drawn and negotiated. Recognition is also tied to gendered norms of appropriate behavior, norms that are as much (or more) linked to members' household and family identities (as brothers, mothers, daughters etc.) as to their functions and work as irrigators and water users. In this sense women's water control is indeed dependent upon the existence of collectivities, and this very dependency also marks women's vulnerability: when they are seen to misbehave, or upon divorce women risk losing rights of access and control. Women's vulnerability in terms of resource security partly reflects and partly adds to their overall weaker bargaining position and powers, and makes them prone to emotional and physical abuse.

In day-to-day irrigation realities, the reciprocity and mutual support between male and female family and community members proclaimed by the 'andeanist' discourse are indeed important values in many Andean communities, and provide an important normative framework to guide behavior. However, these are not the only values that people (both men and women) refer to when using and controlling water. Water control in Andean irrigation systems is simultaneously governed by notions derived from the (various) andeanist discourses, alongside elements more typical of 'modern' capitalist market relations and ideologies and laced with cultural traits of the 'bureaucratic tradition' in irrigation (Lynch, 1993). Intermittent and permanent male migration is one very visible and influential sign of changing practices and ideas. Because of male migration and because of the increasing interactions of communities with 'outside' institutional and political structures and networks, traditional gender roles have changed and continue to change, with women taking on roles and functions that used to be reserved for men. Indeed, the appeals to cultural authenticity and difference that are implicit in the andeanist discourses should be seen as visions of a desired future, or as reflecting an idealized normative ordering of society, rather than being used as the 'real' or more accurate interpretative frameworks for, or reflections of, actual irrigation realities. Such realities do, after all, not exist in isolation from their histories and political and economic environments.

Both stereotypical discourses also share an overly simplistic understanding of water rights. The dichotomy between 'individualized, male-biased rights' on the one hand and 'family rights' (or collective community rights) on the other fails to capture the different dimensions of a water right: the socio-legal, the technical and operational and the organizational dimensions. It also fails to capture the differences between reference, activated and materialized rights. The claims and powers of a water right, as well as the different obligations that are associated with it, cannot be

easily predicted on the basis of either prevailing ideologies or on the basis of formal legislation. Instead, understanding water control requires a contextualized understanding, based on particular water use, distribution and decision-making practices and processes. The rights, powers and responsibilities a right entails also vary depending on the specific social domain referred to. In households, rights become embedded in wider intra-household relations and negotiations. In the fields, location of the fields in relation to the canals and relationships with field-neighbors co-influence one's water security. In formal meetings, the ability to publicly voice concerns and authority and respect matter in determining one's success in bending decisions to one's favor. In each domain, the social relations between the different water actors are governed by different rules and norms, while their identities may also be differently shaped and performed depending on the domain. Importantly, *what* is struggled about also varies depending on the domain in which it takes place.

A last source of representational error of the two discourses lies in their conceptualization of gender. Both discourses tend to portray gender relations as if there is a sharp and neat distinction between masculine and feminine water roles and identities. The reviewed irrigation studies show the large variety of roles men and women can have, and how gender relations and identities interact with other social relations. More importantly, perhaps, is that gender is seldom the primary or most important axis along which water responsibilities and identities are divided, nor can water needs and interests be easily categorized on the basis of gender. It would in fact be no exaggeration to say that the only thing most female irrigators have in common is their lack of formal rights and powers. What women and men do, need and want in relation to water is only partially shaped by gender, and a function of complex social and political dynamics. These dynamics are clearly gendered, but often not in such a straightforward way to allow a clear demarcation of gendered water interests and needs. The reviewed evidence very clearly shows that even though water needs and interests are clearly gendered in their manifestation, there are not many instances where it would be strategically wise for women to engage in water struggles *as women* or on the basis of their gender identity.

Discourses and politics

Both the 'feminist' and the 'andeanist' discourse can be seen to create an image of women in a rather narcissistic way, as reflecting their own idealized visions of society rather than the experiences and lives of women irrigators. This is, we argue, not coincidental given the political context in which the two discourses have evolved and are used, and given the strategic objectives for which they are employed. The gender and irrigation representation of the 'andeanist' discourse belongs to a larger narrative in which the *indígena* way of living is contrasted to that of non-*indígenas* and the (neo-) colonial west, and in which *indígena* women are contrasted to white, western and mestizo women. These contrasts serve the purpose of clearly

delineating a distinct indígena identity, which in turn is instrumental in demands of the indígena movement for cultural recognition and which serves the purpose of justifying and protecting the importance of the indígena cause on national political agendas. The 'feminist' discourse, on the other hand, primarily serves the purpose of establishing the importance and legitimacy of feminist concerns on national agendas, and on the agendas of international and bilateral donor agencies²¹. 'Feminist' representations of irrigation realities are often aimed at ensuring continued political and financial support to gender in development projects and programs. As such, they also reflect the struggles of 'gender experts' and feminists working in development cooperation, many of whom had to justify their own existence in addition to that of the women they hoped to represent. Both discourses are not primarily aimed at establishing the discursive and political existence of women as irrigation subjects in what I have labelled the 'first irrigation world', or of gender as an irrigation concern. This is why both have shortcomings when used for this purpose.

The choice of 'andeanist' inspired arguments in water struggles of peasant and indígena movements reflects their deep and historically evolved mistrust of the state when it comes to protecting the rights of indígena groups. The choice provides a critique to feminist inspired analyses and strategies that unduly emphasize the separation of the genders, and the desirability of women's individual autonomy, to the neglect of the recognition of interdependencies and complementarities. Many Andean peasant women themselves would not easily identify with analyses that stress individual autonomy over family and community values, especially since their present water security importantly relies on arrangements that exist *outside* the formal entitlement structures in which the 'feminist' strategy has vested so much hope and confidence. What is maybe equally important is that stressing individual rights over collective rights carries its own real dangers in the current neo-liberal era, since it makes rights prone to alienation and dispossession through market transfers (see also Ahlers, 2004). Ironically, and at the same time, the political effects of too stringently adhering to just the Andean worldview may also be contrary to the desired ideal of harmonious collectivities. In particular, exclusively addressing and supporting men as water leaders and decision-makers risks undermining this ideal by introducing unwarranted differences and gaps between the genders through the unilateral empowerment of men, and by separating water activities in the fields from water management decision making. Complementarity and reciprocity require a fairly level playing ground in which both men and women can interact as equal partners.

The reviewed evidence suggests that different 'discursive regimes of representation' need to be analyzed and understood not only in terms of how accurately they reflect irrigation realities, but also in terms of their strategic

21 Most of the studies reviewed for this chapter were in fact commissioned by donor or development agencies.

contribution to the particular struggles in which they are used. As argued above, the fact that most water struggles are not directly gendered explains that women do not become visible *as women* in the discourses that frame the water demands of peasant and indígena water communities.

Discursive and political subjectivities

The presented evidence poses an important challenge to the constitution of gendered water subjectivities. The evidence suggests that even though women recognize themselves, and are recognized by others, as important providers of labor to irrigation and agriculture, such recognition often continues to take place within discursive frames of reference that interpret these tasks as work that is marginal or of less value, or that renders it invisible by subsuming it under the work of collectives (families or communities) of which men are mostly recognized as the heads and spokespersons. Existence as an irrigation actor is implicitly predicated on masculinity. Recognition in these discursive terms does not justify the attribution of rights and powers of decision making to women, nor does it grant them a lot of room of maneuver as discursive and political subjects. In fact, the 'andeanist' discourse tends to mark and confine women's subjectivity to that of the safe-guarders of tradition. Precisely because women are often the ones who, because of their lesser mobility and education, stay behind in villages when their husbands and fathers migrate and move about, they are also the one who both literally and politically represent 'traditional' peasant and indígena communities (cf. Laurie and Radcliffe, 2001). Women become, and get marked and constructed as, the most Indian, and increasingly are seen to have a special responsibility of adhering to traditional customs. Femininity thus becomes the sign and symbol of indigeneity, a discursive construction that locks women into very confined and stereotyped roles and behaviors and that risks to doubly delegitimize them in professional irrigation contexts: they are 'others' as women *and* as indígenas.

Of-course, in day-to-day water realities women (just as men) are not 'locked in' or solely constituted by one discourse. The very existence of more than one discourse in itself offers possibilities for power and the formation of alternative subjectivities. The relation between different discourses is not just one of domination and resistance, but also one of interaction, mutual influence and negotiation. The realities and identities of Andean irrigators are shaped as much by historically rooted concepts and truths, those that provide the ammunition for the current indígena quest for the 'right to be different', as by 'imported' or 'copied' concepts and truths (Boelens and Dávila, 1998; Flores Galindo, 1988) such as those provided by the 'engineering' and 'feminist' discourses. In struggles over water, and especially in water rights negotiations, Andean water users strategically select concepts, norms, procedures and arguments from different discourses in order to represent themselves and legitimize their position and control over water. For example, powerful mestizo men may refer to 'traditional' Andean norms derived from

'andeanist' discourses to resist indigenous women's assuming of leadership roles in irrigation communities, while these same men may refer to ideas borrowed from 'feminist' discourses in project proposals to obtain external funding for irrigation rehabilitation and construction (Arroyo and Boelens, 1997; Gutiérrez and Cardona, 1998). In the same vein, women who struggle to obtain more control over water within households and communities may refer to a 'feminist' discourse emphasizing individual rights and autonomy and recognizing gender conflict, while the same women may refer to discourses emphasizing community harmony and collectivity when defending proposals for new 'indigenous' water laws in dealings with State authorities (CONAIE, 1996; see also Radcliffe, 2000).

This suggests that in terms of creating spaces to think and act on gendered inequities in irrigation, forms of representation always need to be read in relation to particular contexts, where it may well be that it is the linkages and the combined use of different representational forms that hold the key to effective political action and participation of women. Indeed, it may well be that important possibilities for feminist representation precisely lie in the spaces that have their origins in the disjunctions between complex realities and idealized discursive ones, or in the discontinuities between different discursive realities. This hypothesis is informed by such feminist scholars as Minh-Ha, who introduced the concept of the 'inappropriate/d other' to designate the subject who operates from within and outside the boundaries of the dominant culture. The inappropriate/d other is neither fully displaced nor amalgated, but can move between margin and center, articulating the experience of dislocation without succumbing to alienation and exile (Minh-Ha, 1989). According to Haraway, this inappropriate/d other exists "within a critical, deconstructive relationality, in a diffracting rather than a reflecting (ratio)nalitY - as the means of making potent connections that exceed domination" (Haraway, 1991).²² Realizing the emancipatory hopes and potential expressed by such thinkers of-course crucially depends on women's own access to different interpretations of their own lived experiences and realities, and to the possibilities different discourses available to them offer for their protagonism.

22 The inappropriate/d other resembles Spivak's 'subaltern' in that the subaltern subject, too, is situated at the periphery of discourse and knowledge, constructed half in and half out of the colonialist paradigm. The female subaltern subject is even more marginalized, for "If, in the context of colonial production, the subaltern has no history, and cannot speak, the subaltern as female is even more deeply in the shadow" (Spivak, 1988). Foucault suggested that among groups that find themselves in this way in the margins of discourse, one might encounter 'subjugated knowledges', 'located low down on the hierarchy', which are sufficiently out-side the mainstream that their 'validity is not dependent on the approval of the established regimes of thought'. Feminist scholars such as Spivak have argued that women are among those possessing such 'subjugated knowledges'.

Wedlock or deadlock? Conclusion and discussion.

"...the most obvious lesson of traveling between the city and the village, between the crowded street and the open field, was that reality shifted. Where the plates of different realities met, there were shudders and rifts, chasms opened. A man could lose his life." (Salman Rushdie, The Ground Beneath her Feet).

Until the lion has her own storyteller, the hunter will always have the best part of the story.
West African proverb

The previous chapters reflect my efforts to meaningfully think gender in irrigation, and to explore conceptual possibilities for seeing women as legitimate irrigation actors. I embarked on these efforts when I started realizing that most existing conceptual languages, the conventional and 'normal' ways of making sense of irrigation realities, provide very little space for women to exist. They also make it difficult to recognize gender as an important force in shaping irrigation realities. The images produced when using the concepts, discourses and languages that belong to normal irrigation professionalism tend to marginalize and misrepresent women while at the same time naturalizing and normalizing those gendered power relations that, from a feminist perspective, need questioning. Such misrepresentation is not just an academic concern, but also a political one: it justifies important decisions about how rights to resources are allocated, it shapes irrigation investment decisions, and it co-determines the amount of space dedicated to questions of gender on irrigation policy agendas. It contributes, in sum, to maintaining a social irrigation order in which women are not accorded the same powers, rights and resources as men.

The book's project can be characterized as one of critical transformative engagement with irrigation thinking. Unlike some streams of feminism, I do not consider irrigation as intrinsically working against women or gender equity. Adopting more ambivalent feminist approaches to irrigation, I have conceived of my project neither as the celebration of women's connection with the natural as a basis

for condemning men's with the technological, nor as the simple embrace of the technological as a means to liberate women from the natural, but rather as a renegotiation of both gendered identities and scientific (and technological) rationalisms. This approach opens up possibilities for more nuanced and productive engagements between feminism and irrigation. I have chosen to explore the contradictions between the concepts and methods of Feminists and those of Irrigation Engineers, and treat those as sources of valuable inspiration for the project of 'seeing' women and questioning gender in irrigation. In what follows in this last chapter of the book, I use the findings of the previous chapters for a more general reflection on the possibilities of feminist knowledge and representation in irrigation. For all their differences in theme, approach and focus, the different chapters together do convey more general ideas to fuel such a reflection, and they do provide different ingredients of the larger 'thinking gender in irrigation' project of the entire book. I use the chapters' findings to formulate possible answers to its main question: "*How can one conceptualize irrigation realities in ways that enable recognition of gender as constitutive?*"

My conceptualization of gender importantly frames the nature and direction of the search for answers to this question. Important in this conceptualization is the recognition that the meaning of gender is a site of contestation and negotiation. An important condition for meaningfully thinking about gender in irrigation, therefore, is that gender is not treated as a given, as something that simply exists and can be known in a positivist sense, but that its meaning is socially constructed, negotiated and contested. What it means to be a man or a woman, is not a given and cannot be determined in any a- or trans-historical or transcendental way. As a shifting and contextual phenomenon, gender does not denote a substantive being, but is a relative point of convergence among culturally and historically specific sets of relations. Gender roles, identities and relations are not tangible and static, but are matters of controversy and debate, of continuous re-interpretation of meanings and practices. The question about the social usage and effects of gendered categories and meanings is the question that lies at the heart of the book's endeavors.

Yet, such a contextualized and constructivist understanding of gender is hard to reconcile both with the Feminist wish to establish women as a political category with similar interests and needs as with the professional Engineering habit of stripping away context and meaning to uncover universal human cores in efforts to generate generic lessons about irrigation performance. Many of the dangers arising from liaisons between Feminists and Engineers have their roots in these political and ontological incompatibilities that have ramifications for possibilities of knowing irrigation realities and for making truth claims about irrigation. I use this last chapter for reflecting on these dangers. I have divided the chapter in two sections, the first of which deals with the implications of my understanding of gender (and feminism) for irrigation thinking. The second section deals with the tensions and dilemmas of the politics of (feminist) knowledge. I end the chapter with casting some critical doubts on the project of 'visualization and representation' this book was about. The fact that

similar doubts have also been expressed by irrigation and water scholars raises hopes about possibilities for new and fruitful alliances and engagements between Feminists and Engineers.

Straddling boundaries, changing metaphors

The irrigation realities presented and discussed in the previous three chapters, just as the examples of such realities given in the rest of the book, provide an illustration of how thoroughly irrigation is shaped by gender. Irrigation tasks and activities may be gender specific, the allocation of rights and benefits of irrigation is often gendered, specific irrigation responsibilities tend to be gendered in that they are associated more with masculine or feminine behaviors, and ways of talking and thinking about irrigation are often couched in gendered symbolisms. Work, roles and rights are typically differentially appreciated and valued and convey different powers depending on whether they are associated more with men or with women. Yet, conventional ways of describing and making sense of irrigation do not normally consider this gendered-ness. Worse still, they tend to focus on men's experiences, activities and roles and take these as representing and explaining the functioning of irrigation systems.

In the first chapter of this book, I have labeled normal irrigation thinking as truly 'masculine' in that irrigation narratives de-value women's contributions or render thinking and speaking about women irrelevant. The various and numerous irrigation activities women do are not only not seen, but they also have gradually come to be defined as 'non-irrigation' – in the sense that they are considered irrelevant to the irrigation profession -- and even as 'non-professional'. Most normal irrigation texts tend to limit the identification of important irrigation actors to those individuals who have a functional (and often formalized) link to the irrigation system. Gender concerns also tend to disappear into the background because in most professional interpretations of irrigation realities, gender relations and identities do not belong to the domain of what needs to be explained, but are taken for granted or 'blackboxed'. And at an even deeper level, questioning gender within irrigation thought is difficult because existing ways of thinking, speaking and writing about irrigation realities inherently pre-suppose and are built on a hierarchical (social, biological or psychological) dichotomy between women and men. This dichotomy is associated with familiar conceptual and symbolic distinctions such as the ones between production and consumption, between private and public, or even between reason and emotion or nature and culture, which provide the invisible foundations for many theories on the functioning and management of irrigation systems. The absence of a critical interpretative tradition of knowledge seeking in irrigation provides an additional strong barrier to the inclusion of gender.

This explains why a focus on women and gender generates some important challenges to more conventional irrigation representations, and why the possibility to see and question gender in irrigation depends on meetings such challenges. In what follows in this section, I summarize and reiterate these challenges. I have divided them in three categories, which are related and sustain each other in important ways. The first relates to the way in which irrigation systems and realities are ontologically defined and to the ways in which the conceptual boundaries are drawn between that 'what matters' for knowing irrigation and that what can be ignored. The second has to do with how human beings and human behavior are conceptualized as rooted in a universal human essence or core. And the third relates to how the belief in such a universal human essence has sustained the possibility of the transcendence of the knower from time, space and body through reason.

Gendered spaces, metaphors and definitions

Much scientific thinking, including thinking about irrigation, is informed by powerful dichotomies -- such as nature-culture, private-public, work-home, production-reproduction, technology-society --, many of which have a strong gender connotation. The fact that irrigation tends to be placed on the culture, public, work, production, technology side of the equation and women on the other forms one important impediment to understanding gender in irrigation realities. This is so because women tend to be symbolically and metaphorically associated with everything that is NOT irrigation. The conceptual delimitation of what counts and matters in irrigation, of what belongs to the irrigation domain, and the definition of what is good and accepted irrigation behavior are deeply structured and colored by the above mentioned gendered dichotomies. Feminist scholars have clearly pointed out how the 'masculine' pole of these dichotomies tends to be valued much more positively and tends to get attributed with more powers and status than the 'feminine' pole. As I have shown in chapter 2, some feminisms, and some streams of ecofeminism are prominent in defending this position, have therefore argued for a reversal of this hierarchy, and for a re-valuation of the feminine. Others, instead, have argued in favor of strategies that would facilitate and encourage women's entry into the masculine worlds of production, politics and reason. Although I share the belief in the importance of more positively judging all that is associated with the feminine, and although I also see the merits of the integrationist strategy, my own feminism importantly consists in critically questioning the ways in which the poles are defined. The boundaries that separate nature from culture, private from public, work from home, and so on, are not fixed and a-historical, but contingent and socially constructed. Showing that this is so is an important way to start questioning taken-for-granted gender hierarchies and dichotomies. Also, the positing of these boundaries invites the treatment of each of the respective poles of the dichotomies as analytically separate, whereas they exist because of and through each other. This recognition is another important building stone of my feminist project.

In my formulation, the ability to 'see' women and to question gender in irrigation therefore importantly depends on a re-thinking of these dichotomies, and of their gendered connotations. Important in this exercise is the recognition that irrigation realities never neatly follow oppositional binaries that place men in one space or metaphorical category and women in another. Gender operates within social categories rather than producing bounded groups of men and women (cf. Jackson, 2002). Irrigation needs and interests, and irrigation activities, are seldom directly gendered and are seldom just a function of a person's gender. The ways in which gender mediates irrigation realities depends on time and location and is mediated by class, ethnicity and other cultural and socio-economic structures and identities.

Important, too, in re-thinking dichotomies, is a questioning of the ways in which the conceptual boundaries between the irrigation system and its environment are drawn, and of the ways in which such boundaries rest on or invoke gendered symbolisms and associations. The previous chapters have illustrated how conventional understandings of what constitutes the activity of irrigation, an irrigation system or a water users' organization tend to be grafted on a masculine root. The presented evidence suggests that the view that women are 'excluded' from irrigation may well turn out to be ideological and itself the result of a distorted or partial ontology of irrigation realities. Likewise, the ways in which normal irrigation thinking conceives of water rights and powers often associates these with their more formal and visible manifestations, thereby often reifying rather than critically questioning the demarcation of gendered domains of influence.

A questioning of these ontological boundaries and definitions may start with simply allowing for the possibility that women are farmers and decision-makers and that men are fathers and husbands. It may also involve the inclusion of the domestic and private domains as arenas in which important irrigation decisions come about. It includes critically revisiting of what is recognized and defined as irrigation behavior, and of who are recognized as irrigation actors. What is implied in such definitions may well in itself be gendered. Rather than positing or a priori assuming the meaning and boundaries of irrigation systems and households, and the criteria for inclusion in the irrigation world, these should be made central to any effort to know and represent irrigation realities. How do different water users, managers, politicians and others define 'inside' and 'outside' the system? Who is seen to 'belong' to the system, and what counts as 'good' irrigation behavior and why? Are these terms, boundaries and standards negotiable, and in what ways are definitions and conceptual boundaries themselves a way of defining and reconfirming ideas about gender, or of distinguishing masculinity from femininity?

Also important in re-thinking the gendered dichotomies that provide the foundations for much irrigation thinking is the realization that there are important linkages, connections and inter-dependencies between the two poles of each dichotomy. For instance, the boundaries between 'the private' and 'the public' - or between 'production' and 'reproduction' - are often not very neat and clear. The

example of the Dakiri irrigation system given in chapter 4 provides a good illustration of this. Here, the difficulty to clearly separate a household from its wider social environment, and the fact that irrigated farming behavior cannot be seen as a straightforward function of economic production rationality, seriously calls into question conventional categorical conceptual divisions. More importantly, the Dakiri case illustrates how what happens 'within' the irrigation system is intrinsically related to what happens 'outside' of it. The ways in which work is divided, the distribution of fields and plots and the sharing of harvests and incomes are embedded in larger webs of conjugal and wider kinship ties and inter-dependencies that provide the basis of livelihood strategies and food security. In a similar fashion, the case of the Chhattis Mauja in Nepal suggests that the successful performance of the male-dominated water users' organization cannot be explained by only referring to characteristics 'internal' to the organization. Instead, this success importantly depends on the work and decisions of women that take place in the so-called 'private' domain. What these and many other examples suggest is that the worlds of work, production, politics, reason and logic are not as disconnected from and unrelated to the world of care, consumption, intimacy, emotion and affection as much conventional thinking suggests. Reconstructing the linkages between these worlds, and learning to see how they are in part defined by and constituted through each other, is central to the feminist project in irrigation.

Notions such as 'sociotechnical systems' (Mollinga, 1998), 'waterscapes' (Swyngedouw, 1997) and 'naturecultures' or 'cyborgs' (Haraway, 1991) provide important ingredients for an ontology of irrigation systems that allows to overcome thinking in gendered binaries. These notions capture the insight that the boundaries between the two binary poles are themselves socially constructed. They envision human activity and nature as being in negotiation and interaction, shaping landscapes which are dynamic and continuously contested in a process that is constituted by, and simultaneously constitutes, the political economy of access and control over resources (Haraway 1991, Swyngedouw 1997).

Conceptualizing gendered behavior and gender identities

Normal irrigation thinking is pervaded with a belief that, given the proper technologies, institutions and incentive structures, human beings will display the same irrigation behavior everywhere. This belief is rooted in the idea of the universality and homogeneity of human beings, in the idea that there is some human essence or core that all people share, and that indeed characterizes humans from non-humans. Such essence is usually thought to lay in human's capacity to reason. This characterization rests on and sustains the above referred to assumption that it is possible to neatly draw the boundaries between what is 'human' (or social) and that what is 'non-human' - animals, nature, technology. It also provides the basis of much thinking about gender as it rests on a division of the world in 'biology' or 'nature' - sex - and 'culture' or 'society' - gender. Originally, such a division

allowed naming the 'problem of women' in such a way as to maintain the possibility of feminist change. With the realization that also the definition of gender rests on binaries that themselves require questioning, doubts about whether it is fruitful to try to keep biological and social properties apart have also increased.

In the previous section, I have explained why I reject binary divisions on the basis of how they make the exercise of seeing and questioning gender in irrigation difficult. For largely the same reasons, I am also critical of the belief in some core or essence that all humans share, a core that can be uncovered and revealed through deductive research methods. The idea of such a human core is closely connected to liberal ideals of individualistic autonomy which "conceive of individuals as social atoms who realize autonomy through independent self-sufficiency and self-creation in selfish detachment from human connection" (Friedman, 2000:217). It resonates well with the methodological individualism that is so popular both in economic as in most streams of irrigation thinking, and that also feeds into liberal feminist ideas of emancipation as consisting of individual autonomy. I concur with many feminist scholars who have questioned these theories and methods. Individuals do not create themselves, but all human beings are raised and socialized by other human beings, and most remain dependent on others in at least some ways over the whole course of their lives. Processes of socialization incorporate cultural resources such as language, modes of thinking and practical habits into the very identity and consciousness of persons.

The implication of this is a conceptualization of gender not simply as the differences between women and men as separate social categories, but as social relations between them. A social relational approach involves "treating women not only as individuals, and as a social category, whose problems appear to be somehow connected to characteristics of this category, but as parties to sets of social relations (involving resources, rights, responsibilities and meanings) with men and other women through which what it means to be a woman, in that time and social place, is defined and experienced. Autonomy for women, as an objective of development, has to be questioned, for the autonomous individual does not necessarily enjoy greater well-being (Jackson, 2002:501). Importantly, such a relational approach means that gender is not a personal trait of individuals, but rather a domain of social practice: it is the social practices in these domains that produce the patterning of gender. Where much irrigation thinking assumes a universal, often implicitly male, person, this conceptualization of gender brings with it the idea that what a person *is*, and indeed what gender *is*, is always relative to the constructed relations in which it is determined (Butler, 1999). As a shifting and contextual phenomenon, gender does not denote a substantive being, but a relative point of convergence among culturally and historically specific sets of relations. Gender roles, identities and relations are not tangible and static, but are matters of controversy and debate, of continuous re-interpretation of meanings and practices. Indeed, "beings do not preexist their relatings" (Haraway, 2003:6), and "biological and cultural determinism are both instances of misplaced concreteness – i.e. the mistake of, first, taking provisional and

local category abstractions like 'nature' and 'culture' for the world and, second, mistaking potent consequences for preexisting foundations" (Haraway, 2003:6).

The questioning of theoretical humanism not only implies the rejection of the idea of an autonomous self as a sociological premise, but it also demands a rethinking of the western ideal of emancipation as consisting of the freeing of such a self from the constraints imposed on it either by traditions, culture, religion and superstition, by repressive capitalist relations of production or by oppressive patriarchies. This idea lies at the basis of many streams of feminism, with the idea of the liberated independent woman figuring as their ultimate ideal. The idea that subjects are situated, and of selves that are not pre-existing but that are formed and constituted through cultures, languages and relationships with others, fundamentally challenges the desirability and possibility of this ideal. The stories and experiences of men and women irrigators in Burkina Faso, Nepal and in the Andes provide a similar challenge: their relations with each other, and with other women and men, are crucial to their sense of who they are. The liberal western feminist emphasis on independence was and is actively rejected by representatives of the Andeanist movement. Here, the challenge lies in recognizing that feminist ideals cannot consist in rejecting all relations of dependence and togetherness, while simultaneously admitting that such relations may create important vulnerabilities and inequalities. The search, therefore, is for a freedom that is situated in social connections, alliances and solidarities (cf. Vintges, 2003:9).

Knowing and the knower

A last set of challenges posed by the wish to see women and question gender in irrigation is related to the two previous ones and has to do with the firm anchoring of irrigation thinking in modernist and Enlightenment traditions of thought, and more in particular with the faith in the neutrality of reasoned judgment, in scientific objectivity and in the progressive logic of scientific reason. This faith has it that through the omnipotence of reason, transcendence becomes possible, allowing the knower to escape the limits of body, time and space. This is what Haraway has called the 'god-trick': the assumption that one can see everything from nowhere, and that disembodied reason can produce accurate and objective accounts of the world (Haraway, 1991). The utilitarian philosopher Jeremy Bentham also used the idea of a 'god-view' from nowhere and everywhere in his design of the panoptical prison in the eighteenth century, a design that inspired Foucault (1979, 1984) in his ideas about power, discourse, disciplining and normalization.

Thinking in binaries and the positing of a universal human core together support, and are reflected in, the ways in which much irrigation knowledge envisions the relationship between subject – the producer of truth statements – and object – that about which truth statements are produced. Where binary thinking and the existence of a universal human core need to be questioned, the idea that things can be known by separate and interchangeable knowers whose specificities of

embodiment and subjective location disappear in the process also requires questioning. It is the idea of objectivity, an epistemological norm that occupies an important place in the irrigation world. Objectivity has it that things in the world are independent of us, and that their behavior is constrained and determined by their natures. These can best be discovered by looking for the regularities that reveal them in normal circumstances (cf. Langton, 2000:135). It maybe that precisely because Irrigation Engineers, as professionals who are involved with the 'applied' and the 'practical', are not generally considered as 'real' scientists that they are even more attached to this epistemological norm than those 'real' scientists themselves. In any case, calls for objectivity and 'proven and established facts' are widespread and recurrent in irrigation and wider water debates, and such calls are also frequently launched at producers of gender-and-irrigation knowledge in order to dismiss them.

Different feminist and other scholars have criticized the epistemological norm of objectivity. In the strong formulation of Catharine MacKinnon: "Objectivity is the epistemological stance of which objectification is the social process, of which male dominance is the politics, the acted out social practice (MacKinnon, 1987:50 cited in Langton, 2000: 135). In different ways, feminist scholars have shown how produced knowledge always bears the imprints of the social and cultural values of communities of knowers (See for instance, Longino, 1990; Harding, 1986; Hartsock, 1998). For Haraway, 'seeing well' is not just a matter of having good eyesight: it is a located activity, cognizant of its particularity and of the accountability requirements that are specific to its location. 'Seeing well' implies the refusal of any subject/object split in the production of knowledge, insisting on 'the critical and interpretative core of all knowledge' (Haraway, 1991:191). In situated knowledge-making projects, embodied knowers engage with active objects of knowledge, whose agency and unpredictability unsettle any hopes for perfect knowledge and control. Indeed, there are connections and linkages between subjects and objects, and the two can be said to stand in a 'dialogic' relationship to each other (cf. Sayer, 1992:22-42)

This answer of how to deal with the 'subject question' demystifies the wish to provide truth claims in the strict positivist tradition as impossible. It characterizes any effort to describe or represent the irrigation world, in one consistent all-encompassing narrative or discourse as politically dangerous (because of its totalizing and exclusionary effects) and academically suspect (because it hides the knower and her identity and power in cloaks of objectivity). In the words of Nicholson: "Any discursive move which attempts to place itself beyond question automatically invokes suspicion" (Nicholson, 1995:5). Indeed, only from the falsely universalizing perspective of those who are, or think they are, in control and command can 'reality' have 'a' structure. That is, only to the extent that one person or group can dominate the whole, can 'reality' appear to be governed by one set of rules or be constituted by one privileged set of social relationships (cf. Flax, 1986 cited in Harding, 1986:193). In chapter 3 I have tried to demonstrate how much irrigation knowledge has indeed been produced from such a 'master' position. Through irrigation knowledge, those (deemed) in control of water were provided

with agency and subjectivity, a discursive construction that was conditional upon the simultaneous denial or severe limitation of agency to users, farmers or irrigators. It is not difficult to read the evolution of irrigation knowledge in a Foucaultian sense, and to see similarities between Irrigation Engineers and the 'new band of experts' (psychiatrists, hygienists, forensic scientists, theorists of the prison, of education or population that emerged in the nineteenth century) (cf. Hacking, 1986:30) whose ideas about progress, and about what constitutes real human behavior, were devised to turn 'backward peasants' into modern and disciplined irrigation objects.

The politics of feminist irrigation knowledge

The project of this book, that of making women visible and questioning gender in irrigation, is one that is characterized by controversies and ambiguities. As I said in the first chapter, encounters between Feminists and Irrigation Engineers can have the character of dangerous liaisons, threatening to shatter established professional identities and doctrines and involving political as well as analytical dilemmas, paradoxes and uncertainties. Many of those 'dangers' are characteristic of feminist knowledge projects more in general, and relate to the larger uncertainties created by the challenges to positivist science such as the ones described in the previous section. In this section, I further discuss two of these controversies. A first one has to do with the difficulty in reconciling the Enlightenment project of modernity, to which both irrigation thinking as well as feminist thinking are indebted, with the challenges and feminist critiques to this project. A second controversy relates to the feminist need for a political subject. The politically inspired desire to carve out a distinct female identity, a shared womanhood or a shared history of oppression and marginalization is difficult to reconcile with the insight that gender is an open site of contestation.

As troublesome as they are, the best way of dealing with them may be to consider them as "sources of valuable critical tension which should be celebrated rather than avoided" (Jackson, 2002:498). Important, I think, is to treat the controversies not as *logical* problems, but primarily as *political* problems in the sense that what can or what cannot be understood in the name of 'feminism' or 'women' and the kind of claims that are attached to these terms are tied to the diverse situations and needs of specific feminisms and specific women (cf. Nicholson, 1998:296).

Truth, convincing power or both?

One of the book's important challenges consists of improving the possibilities to see women and think gender in irrigation, or of articulating feminist irrigation concerns, without losing the possibility to communicate with other irrigation professionals. As

I have shown throughout the book, remaining too faithful to the existing conceptual categorizations and epistemological premises of 'normal professionalism' in irrigation implies running the risk of remaining caught in its inherent limitations in recognizing and questioning gender and may even inadvertently lead to a reification of existing conceptual and symbolic hierarchies. On the other hand, a complete disengagement from existing irrigation languages and professional cultures risks having little convincing force to those with the powers and resources to establish irrigation agendas and make irrigation decisions. Claiming to possess a more accurate representation of irrigation realities while at the same time admitting that all representations are situated and partial, may seem as effective as holding water with a sieve.¹

This is a problem that is receiving, and has received, a lot of attention from feminist philosophers. In the first chapter, I already referred to how Judith Butler referred to it as 'the circular ruins of contemporary gender debate' (Butler, 1999:11). Sandra Harding referred to a similar dilemma when she wrote that "The problem is (...) that neither feminist theory nor feminist politics stand in a relationship of reciprocity to patriarchal theories and politics. (...) The political power of science and its modernist epistemological strategies cannot be left in the hands of those who currently direct public policy, while we theorists dream of a world different from the one that co-opts the 'intelligentsia' into the activity of such 'harmless' dreaming. Feminists cannot afford to give up the successor science projects; they are central to transferring the power to change social relations from the 'haves' to the 'have-nots'." (Harding, 1986:195) In Donna Haraway's words, the problem is how to have simultaneously an account of radical historical contingency for all knowledge claims and knowing subjects, a critical practice for recognizing 'semiotic technologies' for making meanings, and a no-nonsense commitment to faithful accounts of a 'real' world, one that can be partially shared and friendly to earth-wide projects of finite freedom, adequate material abundance, modest meaning in suffering, and limited happiness (Haraway, 1991:187). Rosi Braidotti asked, from a slightly different angle, "How can we renew our thinking within the conceptual categories we have inherited, which have structured our system of thought? How can we at least be equal to the discursive world of modernity, in which there are no longer any possible globalizing responses?" (Braidotti, 1991:47)

1 It is one reason why some feminists have argued that claims of universalisms and essentialism are sometimes needed: they argue that the articulation of feminist concerns depends on its cultural, political and discursive environment. Universalist or essentialist claims are seen as necessary moments of contestation. Thus, Rosi Braidotti has argued that nowadays a feminist who is interested in sexual difference "cannot afford not to be essentialist" (Braidotti, 1989:93 cited in Mc Nay, 1992:20). Judith Butler, in the preface of the 1999 edition of "Gender Trouble" revisits her earlier condemnation of claims of universality: "... I came to see the term has important strategic use precisely as a non-substantial and open-ended category ... (I) came to understand how the assertion of universality can be proleptic and performative, conjuring a reality that does not yet exist, and holding out the possibility for a convergence of cultural horizons that have not yet met." (Butler, 1999:xvii-xviii)

A second 'danger' in meetings between Feminists and Engineers has to do with the tension between the necessity to establish 'women' as relevant irrigation subjects and the insight that the meaning of 'women' is always contextual and relational. As I explained in the third chapter, for women to gain a legitimate entry and existence in irrigation worlds, there are two possible strategies: the first is to claim existence on the basis of womanhood, and the second is to claim existence on the basis of 'sameness' to men. Both strategies are not very attractive because of how they delimit the meaning of gender, and because they close off further thinking and questioning about gendered identities, meanings and structures. They also rest on the assumption of similarities and commonalities among women that are difficult to maintain in view of empirical realities, and in view of the many differences among women of different ethnicity, class, nationality, religion, age or sexual preference. With Nancy Fraser and Linda Nicholson, I think this tension, or 'danger', can be partly resolved by adopting Judith Butlers' understanding of the term 'woman' as a site of permanent openness and resignifiability (cf. Nicholson, 1998:296). They suggest that: "The lack of a common content of the social distinction between 'woman' and 'man' does not mean that there are no connections between the diverse meanings of 'woman' and 'man' which do exist. Instead of thinking that either there must be a common meaning to 'woman' across contexts or that there merely exists a disparate assortment of such meanings with no connection; we can instead understand the meaning of the male/female distinction across cultures in another way. We can see it as encompassing a complex web of distinctions evidencing threads of overlap within a field of discontinuities." (Fraser and Nicholson, 1990:35)

Indeed, moving between the dangers of reification and that of isolation, and between that of essentialism or politically empty relativism, is an intricate dance of partial connections and identifications. It consists of a quest for multiple conjunctions, of what Donna Haraway called 'figurations' (Haraway, 1991): ways of expressing feminist forms of knowledge that escape a mimetic relationship to dominant scientific discourse. The book's different chapters bear, in different ways, testimony of the resulting struggle to balance convincing force and intelligibility with representational accuracy and the ability to 'see well'. The realization that thinking about gendered irrigation realities is necessarily done in discursive terms and concepts that are themselves suspect of being masculinist, characterizes it as one of which the horizons shift and move with every next step. Women's first legitimate entry into the irrigation world, for instance, necessarily requires recognition in the terms of the existing irrigation language. It also requires making some rather crude generalizations about what 'women' are. It is only once they thus discursively 'exist' and matter to irrigation professionalism that further efforts can be made to change and transform the qualifications for being or becoming an irrigation subject.² More in general, the politics of knowledge production are such that ways to make women

2 According to Sandra Harding, "it is true that first we often have to formulate a 'woman-centered' hypothesis in order to even comprehend a gender-free one" (Harding, 1986: 138).

matter, or to provide them with a legitimate irrigation existence, intrinsically depend on the languages and systems of thought within and through which this is done. Efforts to change such languages and systems of thought cannot be done from a complete 'outsider' position, but emerge in articulation with them. Knowledge production is, in other words, situated and political as well as never-ending and permanently in progress.

Recognizing this when looking back at the book's project, it can be seen to comprise three periodic 'moments' that are analytically distinct, but interrelated in practice³.

1. The first 'moment' is concerned with the attempt to make women visible to irrigation professionals and to establish gender and gender inequality as legitimate irrigation problems, as something that exists and therefore can be studied. It could be metaphorically characterized as consisting of a widening of existing irrigation lenses to allow seeing and visualizing women and gender. The main questions that belong to this first moment are: What are the conceptual spaces in existing irrigation narratives for acknowledging and recognizing women? How to make women and gender matter to irrigation professionals? How to express gender concerns in irrigation terms?
2. The second 'moment' relates to the attempt to re-describe and conceptualize irrigation realities in such a way as to allow explicit inclusion and treatment of gender as an analytical category. This goes beyond the 'widening the lens of existing irrigation cameras' of the first moment. It also goes beyond just adding gender as one additional variable to the analysis of irrigation problems. It comprises the much more challenging task to describe and analyze gender as a property of social structures and conceptual schemes, as deeply *constitutive* of both irrigation realities as well as of the conventional ways in which they are perceived and conceptualized. Questions that belong to this second moment are: How to (re-) conceptualize and theorize irrigation realities in a way that allows the recognition and analysis of gender as a constitutive category? Which conceptual and discursive representations of gender relations best allow discussion and analysis of feminist irrigation concerns? How to understand irrigation so that it 'matters' to women and feminists, and not just to men and engineers?
3. The third 'moment' relates to the effectiveness of certain representations in establishing political and social legitimacy for feminist concerns in specific irrigation contexts. Questions that belong to this moment are questions of epistemology, as well as strategic questions about the politics of knowledge. How to convince irrigation professionals that the images and narratives produced by feminists are better, 'more real' or at least preferable than those produced by more conventional irrigation discourses? What are the criteria used for judging

3 This distinction follows Nancy Fraser's conceptual unraveling of the 'politics of needs' (Fraser, 1989:164), and reflects thoughts formulated by other critical feminist writers about the linkages between politics and knowledge. See Mohanty, 1991; and Harding, 1986.

the merits of different representations and what tests must these pass in order to be legitimated as knowledge? What is the relation between Irrigation as conceptualized, designed and modeled by planners and Engineers and irrigation as experienced by female and male users? Whose knowledge counts, and whose priorities count? Are more democratic and accountable forms of thinking about, developing and managing irrigation possible?

Feminist knowledge production does not usually take the form of a smooth transition from the first identified moment to the third via the second, but swings back and forth and changes depending on place, time and context. The identification of these moments helps to recognize and understand these politics as a *process*. It helps to understand that and how feminist knowledge is intrinsically political, not only in the sense that different truth claims represent mere strategic moves in political game plans, but also in a deeper sense of the term in that one's understanding of a reality and the kind of claims that can be made on the basis of it are tied to diverse situations and needs. In moving from the first to the third moment, there is a gradual change from how can *we* (feminist irrigation engineers) – a group of people that first needed to come into existence and gain legitimacy through more or less subtle forms of enticing and advocacy – learn to better see *them* (men and women irrigators), to: under what conditions can *they* speak for themselves, represent themselves, and in the process hold *us* accountable to what we see and say. This brings me to the last section of this concluding chapter, which expresses the suggestion that what is needed for positive changes in irrigation is not simply new forms of expertise, but also a democratic transformation of public irrigation and water debates and policy processes.

Seeing, representing, managing, controlling...

In many ways, the project of this thesis can be seen as a project of 'visualization'. It is rooted in the hope that visualization will lead to the political recognition of women, and of gender as a key axis along which irrigation powers and responsibilities tend to be divided. The visualization project is based on a number of key assumptions, all of which can and need to be questioned. These questions could be seen to represent a third controversy or 'danger' of feminist knowing in irrigation and they are fuelled by criticisms such as those articulated by Mohanty who claimed that western feminist scholarship colonizes the material and historical heterogeneities of the lives of women in the Third World (Mohanty, 1991) and Spivak, who demonstrated concern for the processes whereby postcolonial studies ironically reinscribe, co-opt and rehearse neo-colonial imperatives of political domination, economic exploitation and cultural erasure (Spivak, 1988). I use this last section to discuss these questions. It is fortunate that similar ones have been expressed by irrigation and water scholars,

which is why I think they may provide a promising entry-point for further engagements between Feminists and Engineers.

Visualization and representation

In the first chapter, when outlining the contours of my project, I quoted Judith Butler on representation: "On the one hand, representation serves as the operative term within a political process that seeks to extend visibility and legitimacy to women as political subjects; on the other hand, representation is the normative function of a language which is said either to reveal or to distort what is assumed to be true about the category of women." (Butler, 1999:4) The development of a language that fully or adequately represents women, that makes it possible to 'see' women, is often seen as a condition for fostering the political visibility of women. Indeed, the project of this book hinged on the idea that the non- or misrepresentation of women in irrigation thinking importantly contributed to maintaining irrigation orders in which women systematically have fewer rights than men.

Visualization as a political strategy is based on a number of crucial assumptions, all of which I think require critical scrutiny. The first is that discursive invisibility and the resulting misrecognition is always detrimental to 'the marginalized'. Yet, and as was also suggested by the evidence of the head-end irrigators of the Chhattis Mauja in chapter 5, invisibility may have its benefits. Cecile Jackson, reflecting on this same issue, remarks: "The issue of visibility is complex. On the one hand, both women and men devalue and invisibilize women's work. (...) But at the same time, whilst it is desirable to make women's work visible and to make their rights to resources more formal and less conditional on relations with men, we also need to recognize that invisibility and ambiguity may have strategic advantages for women. They may arouse less male resistance and yet deliver subtle forms of influence and power, for silences speak, and invisibility can be an excellent camouflage" (Jackson, 1998:32). The political effects of visualization, therefore, cannot be assumed to be always positive. To whom are 'they' made visible, and what will those who are taught to 'see' do with their newly acquired visions?

Such questions become more pertinent with the realization that visualization can be seen as an effective strategy of the powerful to increase their control. In the words of Escobar, to bring people into discourse is not just an innocent act of making them visible, but it is " mapping them into certain coordinates of control. The aim is not simply to discipline individuals but to transform the conditions under which they live into a productive, normalized social environment." (Escobar, 1995:156) Many feminist philosophers have used lines of reasoning similar to those of Escobar, describing a sort of perception that works to objectify those who it perceives, where seeing it so makes it so when it is backed up by power. For irrigation, how this happens is not difficult to imagine: through the construction of infrastructure designed according to Engineers' ideals, through far-reaching interventions in tenure and labor relations and through other means (taxation, subsidies, etc.), the

behavior of irrigators is molded to suit their discursive existence in irrigation thinking. Indeed visualization may work to *control* the invisible through a Foucaultian type of power the source and workings of which themselves remain hidden, in analogy with the watcher in the Panopticon prison whose controlling techniques importantly depend on his own invisibility.

Although I do not attribute the same powerful force to dominant discourses in shaping realities, I do realize that visibility has its risks in terms of making the visualized more vulnerable to particular forms of registration, control and taxation. Molyneux makes this point when discussing the effects of women's increased visibility in a neo-liberal context. She argues that such visibility has led to seeing women as an important ingredient of the social capital that can be mobilized to render (irrigation) operations more effective and efficient, based on assumptions about their natural predisposition to serve their families and communities, and linked to their responsibilities in the domain of social reproduction. Women are, therefore, increasingly targeted for voluntary, unpaid work, for instance in canal maintenance (See Molyneux, 2002). And Ahlers' doubts about the desirability of individual land- and water titles for women in this neo-liberal era can also be read as an expression of the danger of visibility (Ahlers, 2002). Such analyses, and as I also concluded in chapter 6, not just raise doubts about the project of visualization, but they also suggest that the political effects of visualization depend on the discursive and material characteristics of the particular domain in which visualization occurs.

One implication derived from this realization is that there may be merit in reversing the research gaze in not just 'visualizing' those who are not (yet) seen, but to also 'visualize' the mechanisms of power and the politics that are at work and that tend to remain unseen in the construction of normal irrigation knowledge, and in normal irrigation design and management routines. It would be worthwhile, in other words, to not just study gender relations in what I have called the first irrigation world - and focus on gender gaps in rights and voice -- , but to also direct research attention to the second and third irrigation worlds - the worlds of thinking and professional cultures, respectively -- and to start further unraveling the linkages between masculinities, power and irrigation truths. This implies naming and questioning everything that in conventional and normal irrigation thinking remains unnamed and unquestioned. How do irrigation knowledge and powers get associated with masculinities and how do such associations come to be seen as natural or self-evident?

Another implication is the realization that the belief in the merits of visualization rests on the very possibility of transcendence, the 'god-eye view', of which I argued that it needed to be questioned to allow thinking about gender in irrigation. By extension, this belief rests on the existence of benevolent and all-knowing planners or policymakers, who only require better information - better 'vision'- to be able to implement feminist strategies, or work towards feminist goals. This is obviously naïve, to say the least, and belies the insight that planning and design are complex processes of formal and less formal, legal and illegal, open and hidden interactions

between different interest groups. The logical inference of this insight is that there are important linkages between questions of discursive representation and visibility, and questions of political representation and accountability. It leads to demands for replacing the vertical forms of accountability that characterized 'old' irrigation thinking with more horizontal and human forms of accountability in which the gaps between the 'first' and the 'second' irrigation world are bridged not by further interventions in the first world so as to make it fit with Engineers' beliefs, but by allowing inhabitants and representatives of the first and third worlds to meet, interact and discuss about gendered meanings and identities in irrigation, and about the claims and responsibilities that go accompanied with them. Such insights not just occupy the minds of feminists but, as I further discuss below, also form the subject of some new and challenging thinking about irrigation and water management.

Towards feminist irrigation and water futures...

I would like to end this chapter, and the book as a whole, with noting some trends in thinking about irrigation, and about water more in general, that provide some important entry-points for new engagements and alliances between Feminists and Engineers. A first important one refers to the call for 'integration' in water resources management. I agree with the pessimism and warnings of some authors about the risks and dangers of 'integration', and I particularly share their concerns that integrative moves may provide a new and strong justification for the continued existence of 'hydrocracies' (Rap et al., 2004). I also share with these authors a concern that integration may come to mean the concentration of powers and a loss of democracy - in spite of much rhetoric to the contrary (Dixit, 2005; Wester and Warner, 2002; Blomquist and Schlager, 2005). Yet, I am thrilled by how the new policy vogue of Integrated Water Resources Management (or IWRM) has opened the doors of the professional water world to a much broader group of disciplines, each bringing with them different perspectives, professional orientations and concerns, different cultures and different methodologies, ontologies and epistemologies. Suddenly, water conferences are not predominantly attended by Engineers and Economists, but also by environmental scientists, communication experts, political scientists, sociologists. The spaces and need for interdisciplinary or decompartmentalized thinkers has likewise increased. I think this new plurality of voices and opinions and of knowledges and truth claims is something to be celebrated. It will hopefully lead to new challenges to and criticisms of those truths and knowledges that have attained quasi-hegemonic status in professional water worlds, and it may offer new legitimacy to attempts to prevent the screening off of water wisdoms from critical scrutiny. Signs that this is already happening can for instance be seen in calls for the acceptance of plurality and diversity of water knowledges (Moench et al, 2003), for accepting and recognizing plural laws and institutions (see Roth, Boelens and Zwartveen, 2005; and Bruns and Meinen-Dick, 2000) and in pleas for polycentric instead of mono-centric modes of water

governance (Wester, Vos and Woodhill, 2004). Although such calls do not automatically imply feminist commitment, and although the recognition of plurality and diversity is not in itself a guarantee for redistributive reforms (cf. Fraser, 1997, 2000), they do often stem from concerns about the ways in which powers and authorities are presently distributed and maintained in the water world, and they therefore do open important new conceptual spaces for also thinking about gendered injustice and inequities in this world.

A second promising trend relates to the increased acceptance that there is much more that is unknown in the area of water than there is known, an acceptance that goes accompanied with the abandonment of the desires for full control and predictability that have long characterized the professional water world. There is increased sympathy for the view that an Engineers' conception of an irrigation system as a closed and bounded entity is a recipe for ever increasing levels of uncontrollability and unpredictability, and of failure (Cf. Bolding, 2004; Halsema, 2002), and that 'going with the flow' may be a more appropriate guiding principle of water management than the old motto of 'taming the water'. The 'full control' model was geared towards commensurating the interests and perspectives of all actors in one, or a few, organizations – usually through levels of representation moving from the ordinary users at the bottom to the expert hydrocrat at the top – . The very complexity of water problems provided an important justification for this model, as this complexity would only be understandable by experts, who therefore were also seen to be the most suitable people for managing them. The assumption of the possibility of full and accurate information, both about the quantities and qualities of available water, as about the ways in which water is used and distributed, is what has kept this model in place. Increased acceptance that this assumption is not realistic therefore also paves the way for new thinking about water management and governance, and provides new arguments for dethroning technocrats. With it, new possibilities for voicing feminist concerns, and for articulating feminist alternatives may emerge, as well as new ways of creating accountability for feminist objectives.

References

- Abernethy, Charles L. 1993. Report on a visit to Burkina Faso. Mimeo. Colombo, Sri Lanka: IIMI
- Abernethy, Charles, L. 1994. Report on a visit to Burkina Faso. Mimeo. Colombo, Sri Lanka: IIMI.
- Abernethy, Charles L, Hilmy Sally, Kurt Lonsway and Chégou Maman. 2000. *Farmer-Based Financing of Operations in the Niger Valley Irrigation Schemes*. IWMI Research Report No. 37. Colombo, Sri Lanka: IWMI.
- Adams, W.M. 1990. How beautiful is small? Scale, control and success in Kenyan irrigation. *World Development* 18 (1990) 10, pp. 1405-1416
- Adams, W.M. 1992. *Wasting the rain. Rivers, people and planning in Africa*. London, U.K.: Earthscan Publications.
- Adhikari, Madhukar and Rajendra Pradhan. 2000. Water Rights, Law and Authority: Changing Water Rights in the Bhamke Khola Basin. In: Rajendra Pradhan, Franz von Benda-Beckmann and Keebet von Benda-Beckmann (eds.), *Water, Land and Law. Changing Rights to Land and Water in Nepal*. Kathmandu, Nepal/Wageningen /Rotterdam, The Netherlands: FREEDEAL/WAU/EUR: 71 - 100
- Afonja, S. 1981. Changing Modes of Production and the Sexual Division of Labor among the Yoruba. *Signs*, Winter, 1981
- Agarwal, Bina. 1992. The Gender and Environment Debate: Lessons from India. *Feminist Studies* 18 (1992) 1, pp. 119-159
- Agarwal, Bina. 1994. *A field of one's own. Gender and land rights in South Asia*. Cambridge, UK: Cambridge University Press.
- Agarwal, Bina. 1997a. *Bargaining and gender relations: within and beyond the household*. FNCD Discussion Paper 27. Washington, U.S.A.: International Food Policy Research Institute.
- Agarwal, Bina. 1997b. Environmental action. Gender Equity and Women's Participation. *Development and Change* 28 (1997) 1, pp.1-44
- Agarwal, Anil and Sunita Narain. 1989. *Towards Green Villages. A Strategy for Environmentally Sound and Participatory Rural Development*. New Delhi, India: Centre for Science and Environment.
- Agarwal, Anil and Sunita Narain. 1997. *Dying Wisdom. Rise, Fall and Potential of Traditional Water Harvesting Systems*. New Delhi, India: Centre for Science and Environment.
- Agrapen, WALIR and WUR. 2003. *The Right to be Different. The struggle for water and identity in the Andes*. Video. Wageningen, The Netherlands: Wageningen University.
- Agrawal, Arun and Clark C. Gibson. 1999. Enchantment and disenchantment: The role of community in natural resource conservation. *World Development* 27 (1999) 4, pp. 629-649

- Agrawal, Arun and Clark C. Gibson (eds.). 2001. *Communities and the Environment. Ethnicity, Gender and the State in Community-Based Conservation*. New Brunswick, New Jersey and London: Rutgers University Press.
- Ahlers, Rhodante and Annet Smits. 1991. *Ya mismo. Verschillende aspecten van waterproblematiek voor boeren en boerinnen*. Msc Thesis. Wageningen, The Netherlands: Wageningen University.
- Ahlers, Rhodante. 2000. Gender Relations in Irrigation Districts in México. In: Cecilia Tortajada (ed.), *Gender and Water Management in Latin America*. New Delhi, India: Oxford University Press, pp. 203-216
- Ahlers, Rhodante. 2002. From tied hands to empty hands: the catch-22 of entitlement. A debate on gender, power and water rights. Paper prepared for the 2002 Conference on Feminist Economics, July 12-14, 2002, Occidental College, Los Angeles, California, USA.
- Ahlers, Rhodante. 2004. Gender dimensions of Neoliberal Water Policy in Mexico and Bolivia: Empowering or Dismempowering? In: Vivienne Bennett, Sonia Dávila Poblete and Maria Nieves Rico (eds.), *Opposing Currents. The Politics of Water and Gender in Latin America*. Pittsburgh, USA: University of Pittsburgh Press, pp. 53 - 71
- Ahmed, Sara (ed.). 2005. *Flowing Upstream. Empowering Women through Water Management Initiatives in India*. Ahmedabad, India: Centre for Environment Education.
- Almeida, José V. 1998. Andean social construction of identity and political direction. In: In: Rutgerd Boelens and Gloria Dávila (eds.), *Searching for Equity. Conceptions of Justice and Equity in Peasant Irrigation*. Assen, The Netherlands: Van Gorcum, pp. 203 -210.
- Alden Wiley, Liz. 2001. Making Progress - Slowly. New Attention to Women's Rights In Natural Resource Law Reform in Africa. Paper presented at the CTA/GOU Regional Conference on the Legal Rights of Women in Agricultural Production, Kampala, Uganda, 19-23 February, 2001.
- Apffel-Marglin, Frederique and PRATEC (eds.) 1998. *The Spirit of Regeneration: Andean culture confronting Western notions of development*. London, UK and New York, USA: Zed Books.
- Arnold, D.Y. (ed.) 1997. *Más allá del silencio. Las fronteras de género en los Andes*. La Paz, Bolivia: CIASE/ILCA.
- Arroyo, Aline and Rutgerd Boelens. 1997. *Mujer Campesina e intervencion en el riego Andino. Sistemas de riego y relaciones de genero, caso Licto, Ecuador*. Quito, Ecuador: CAMAREN, Riego Comunitario Andino, CESA-SNV.
- Arroyo, Aline and Rutgerd Boelens. 1998. Andean Irrigation and Gender Equity. In: Rutgerd Boelens and Gloria Dávila (eds.), *Searching for Equity. Conceptions of Justice and Equity in Peasant Irrigation*. Assen, The Netherlands: Van Gorcum.
- Athukorala, Kusum. 1995. Personal Communication.
- Assies, Willem (ed.) 2003. *Gobiernos locales y reforma del Estado en América Latina*. Zamora, Michoacán: El Colegio de Michoacán.

- Bajracharya, Prabina. 2000. Gendered Water Rights in the Hile Khola Kulo Irrigation System, Shakhejung VDC, Ilam. In: Rajendra Pradhan, Franz von Benda-Beckmann and Keebet von Benda-Beckmann (eds.). *Water, Land and Law. Changing Rights to Land and Water in Nepal*. Kathmandu, Nepal/Wageningen /Rotterdam, The Netherlands: FREEDEAL /WAU /EUR : 129 - 146
- Bakker, Margaretha, Randolph Barker, Ruth Meinzen-Dick and Flemming Konradsen (eds.). 1999. *Multiple Uses of Water in Irrigated Areas: A Case Study from Sri Lanka*. Colombo, Sri Lanka: IWMI, SWIM Report 8.
- Baland, Jean-Marie and Jean-Philippe Platteau. 1996. *Halting Degradation of Natural Resources. Is There a Role for Rural Communities?* Oxford, UK: Clarendon Press.
- Bandarage, A. 1984. Women in Development: Liberalism, Marxism and Marxist-Feminism. *Development and Change* 15 (1984) 3:495-515
- Barret, Michèle. 1980. *Women's oppression today. Problems in marxist-feminist analysis*. London, UK: Verso.
- Barnett, T. 1977. *The Gezira Scheme. An illusion of development*. London, U.K.: Frank Cass (1987 reprint).
- Barnett, T. 1979. Why are bureaucrats slow adopters? The case of water management in the Gezira scheme. *Sociologia Ruralis* 19 (1979) 1, pp. 60-69
- Basnet, Kanchan. 1992. *Beyond the chadar and the chardiwari: Women in irrigated areas of Punjab*. Mimeo. Lahore, Pakistan: International Irrigation Management Institute.
- Bastidas, Elena P. 1999. *Gender Issues and Women's Participation in Irrigated Agriculture. The Case of two Private Irrigation Canals in Carchi, Ecuador*. Research Report no. 31. Colombo, Sri Lanka: IWMI.
- Bastidas, Elena P. 2004. Women and Water in the Northern Ecuadorean Andes. In: Vivienne Bennett, Sonia Dávila Poblete and Maria Nieves Rico (eds.), *Opposing Currents. The Politics of Water and Gender in Latin America*. Pittsburgh, USA: University of Pittsburgh Press, pp.154 - 169
- Beccar, L., R. Boelens and P. Hoogendam. 2002. Water rights and collective action in community irrigation. In: R. Boelens and P. Hoogendam (eds.), *Water rights and empowerment*. Assen, The Netherlands: Van Gorcum, pp.1-19
- Becker, G.S. 1973. A theory of marriage: Part 1. *Journal of Political Economy* 81 (1973) 4, pp. 813-846
- Belt, Henk van den. n.d. Five views on technology development: Implications for Democratic Control and Ethical Assessment. Unpublished text prepared for lectures on technology development. Wageningen, The Netherlands: Wageningen University.
- Becker, G.S. 1981. *Treatise on the Family*. Harvard University Press, Cambridge, Massachusetts, U.S.A.
- Benda-Beckmann, von, Franz, Keebet Von Benda-Beckmann and Joep Spiertz. 1998. Equity and legal pluralism: taking customary law into account in natural resource policies. In Rutgerd Boelens and Gloria Dávila (eds), *Searching for Equity*, Assen, The Netherlands: Van Gorcum, pp. 57-69.

- Benda-Beckmann von, Franz, Keebet von Benda-Beckmann and Rajendra Pradhan. 2000. Introduction. In: Rajendra Pradhan, Franz von Benda-Beckmann and Keebet von Beckmann (eds.), *Water, Land and Law. Changing Rights to Land and Water in Nepal*. Kathmandu, Nepal: FREEDEAL, pp. 1-16
- Beneria, Lourdes and Gita Sen. 1981. Accumulation, Reproduction and Women's Role in Economic Development: Boserup Revisited. *Signs* 7 (1981) 2, pp. 279-98 (Reprinted in Eleanor Leacock and Helen I. Safa (eds.), 1986, *Women's Work: Development and the Division of Labor by Gender*. South Hadley, Massachusetts, USA: Bergin and Garvey, pp. 141-57)
- Bennett, Vivienne, Sonia Dávila Poblete and Maria Nieves Rico. 2004. *Opposing Currents. The Politics of Water and Gender in Latin America*. Pittsburgh, USA: University of Pittsburgh Press.
- Bennholdt-Thomsen, Veronika. 1991. Why do housewives continue to be Created in the Third World too? In: Maria Mies, Veronika Bennholdt-Thomsen and Claudia von Werlhof (eds.), *Women, the last colony*. London, U.K. and New Jersey, U.S.A.: Zed Books Ltd, pp. 159-167
- Bernal, V. 1988. Losing ground -- women and agriculture on Sudan's irrigated schemes: Lessons from a Blue Nile village. In: Davison, Jean (ed.), *Agriculture, Women and Land: The African Experience*. Boulder, Colorado, USA: Westview Press, pp. 131-156
- Berkoff, D.J.W. 1990. *Irrigation management on the Indo-Gangetic plain*. World Bank Technical Paper No. 129. Washington D.C., USA : World Bank.
- Beauvoir, de Simone. 1964 (1949). *The Second Sex*. New York, U.S.A.: Bantam Books, Inc. (Originally published in 1949: *Le deuxième sexe*. Paris, France: Gallimard.)
- Bhabha, Homi. 1994. *The Location of Culture*. London, UK: Routledge.
- Bhushan Udas, Pranita. 2000. *Gender, policy and water users' association, a case of WUA Nepal*. MSc thesis. Wageningen, The Netherlands: Wageningen University.
- Bhushan Udas, Pranita and Margreet Zwarteveen. 2005. Prescribing Gender Equity? The Case of the Tukucha Nala Irrigation System, Central Nepal. In: Dik Roth, Rutgerd Boelens and Margreet Zwarteveen (eds.), *Liquid Relations. Contested Water Rights and Legal Complexity*. New Brunswick, New Jersey, USA and London, UK: Rutgers University Press: 21 - 43
- Bijker, Wiebe E. 1993. Do not despair: there is life after constructivism. *Science, Technology and Human Values* 18 (1993)1:113-138
- Bijker, Wiebe E. and J. (eds.). 1992. *Shaping technology/building society. Studies in sociotechnical change*. Cambridge, Massachusetts, U.S.A.: MIT Press.
- Blomquist, William and Edella Schlager. 2005. Political Pitfalls of Integrated Watershed Management. *Society and Natural Resources* 18 (2005) 2: 101-117
- Boelens, Rutgerd and Gert-Jan Temmink. 1990. Irrigatie en Participatie in de Peruaanse Andes. *Derde Wereld* 9 (1990) 1&2: 62-75
- Boelens, Rutgerd and Gloria Dávila. 1998. Introduction to "Equity Considerations in Peasant Irrigation: Case studies around the world." In: Rutgerd Boelens and

- Gloria Dávila (eds.), *Searching for Equity. Conceptions of Justice and Equity in Peasant Irrigation*. Assen, The Netherlands: Van Gorcum, pp. 313-314
- Boelens, Rutgerd and Bernita Doorenbos. 2001. The battlefield of water rights. Rule-making in the arena of conflicting normative frameworks in the Ecuadorian Highlands. *Human Organization* 60 (2001) 4: 343 - 355
- Boelens, Rutgerd and Margreet Zwarteveen. 2002. Gender dimensions of water control in Andean irrigation. In: Rutgerd Boelens and Paul Hoogendam (eds.), *Water rights and empowerment*. Assen: Van Gorcum, pp. 75-109
- Boelens, Rutgerd and Margreet Zwarteveen. 2003. Water, gender and 'Andeanity': Conflict or Harmony? Gender dimensions of water rights in diverging regimes of representation. In: Ton Salman and Annelies Zoomers (eds.) *Imaging the Andes: Shifting margins of a marginal world*, CEDLA Latin America Studies 91. Amsterdam: Aksant / CEDLA, pp.146-162.
- Boelens, Rutgerd and Margreet Zwarteveen. 2005a. Prices and Politics in Andean Water Reforms. *Development and Change* 36 (2005) 4: 735-758
- Boelens, Rutgerd and Margreet Zwarteveen. 2005b. Anomalous Water Rights and the Politics of Normalization: Collective Water Control and Privatization Policies in the Andean Region. In: Dik Roth, Rutgerd Boelens and Margreet Zwarteveen. 2005. *Liquid Relations. Contested Water Rights and Legal Complexity*. New Brunswick, New Jersey, USA and London, UK: Rutgers University Press, pp. 97 - 123
- Bock, Bettina B. 2002. *Tegelijkertijd en tussendoor. Gender, plattelandsontwikkeling en interactief beleid*. PhD Thesis. Wageningen, The Netherlands: Wageningen University.
- Bolding, Alex. 2004. *In hot water. A study on sociotechnical intervention models and practices of water use in smallholder agriculture, Nyanyadzi catchment, Zimbabwe*. PhD Thesis. Wageningen, The Netherlands: Wageningen University.
- Bolding, Alex, Peter P. Mollinga and Kees van Straaten. 1995. Modules for Modernisation: Colonial Irrigation in India and the Technological Dimension of Agrarian Change. *The Journal of Development Studies* 31 (1995) 6: 805-844
- Bolding, Alex, Peter Mollinga and Margreet Zwarteveen. 2000. Interdisciplinarity in research on integrated water resources management: pitfalls and challenges. Paper presented at the UNESCO-WOTRO International Working Conference 'Water for Society', 8-10 November, 2000, Delft, The Netherlands.
- Bonnet, Doris. 1982. *Le proverbe chez les Mossi du Yatenga (Haute Volta)*. Paris, France: CNRS.
- Boserup, E. 1970. *Woman's Role in Economic Development*. London, U.K. : Earthscan Publications. (Reprinted in 1989)
- Boschman, Nina. 1994. *Consideration of Gender Issues in Irrigation*. Report Pilotprogramm Frauenförderung. Berlin, Germany: Deutsche Gesellschaft für Technische Zusammenarbeit.
- Bourdieu, Pierre. 1977. *Outline of a Theory of Practice*. Cambridge, UK: Cambridge University Press.

- Bourque, S.C. and K.B. Warren. 1981. *Women of the Andes. Patriarchy and Social Change in Two Peruvian Towns*. Michigan, U.S.A.: University of Michigan Press.
- Braidotti, Rosi. 1991. *Patterns of Dissonance. A study of women in contemporary philosophy*. Cambridge, UK: Polity Press.
- Braidotti, Rosi. 1997 (1994). Mothers, Monsters and Machines. In: Kate Conboy, Nadia Medina and Sarah Stanbury (eds.), *Writing on the Body. Female embodiment and feminist theory*. New York: Columbia University Press, pp. 3-89 (Originally published in Braidotti, Rosi. 1994. *Nomadic Subjects. Embodiment and Sexual Difference in Contemporary Feminist Theory*. New York: Columbia University Press.)
- Braun, J. von, D. Puetz and P. Webb. 1989. *Irrigation technology and commercialization of rice in the Gambia: Effects on income and nutrition*. Research Report no. 75. Washington D.C, U.S.A: IFPRI.
- Bromley, Daniel (ed.) 1992. *Making the Commons Work: Theory, Practice and Policy*. San Francisco, California: Institute for Contemporary Studies Press.
- Bromley, Daniel and Michael Cernea. 1989. *The Management of Common Property Natural Resources. Some Conceptual and Operational Fallacies*. World Bank Discussion Papers no. 57. Washington, DC, USA: the World Bank.
- Bronstein, Audrey. 1982. *The Triple Struggle. Latin American Peasant Women*. Boston, UK: South End Press.
- Bruins, Bert and Annelies Heijmans. 1993. *Gender biases in irrigation projects: Gender considerations in the rehabilitation of Bauraha Irrigation System in the District of Dang, Nepal*. Unpublished report. Kathmandu, Nepal: SNV.
- Bruns, Bryan Randolph and Ruth S. Meinzen-Dick (eds.). 2000. *Negotiating Water Rights*. Washington, USA: IFPRI. New Delhi, India: Vistaar Publications.
- Brunt, D. 1992. *Mastering the struggle. Gender actors and agrarian change in a Mexican ejido*. Latin America Studies 64. Amsterdam, The Netherlands: Center for Latin American Research and Documentation.
- Bryceson, Deborah F. 1995. African Women Hoe Cultivators: Speculative Origins and Current Enigmas. In: Deborah Fay Bryceson (ed.), *Women wielding the Hoe. Lessons from Rural Africa for Feminist Theory and Development Practice*. Oxford, UK and Washington D.C.: Berg Publishers: pp. 3-22
- Bunker, S. and L. Seligmann. 1986. Organización social y vision ecologica de un sistema de riego andino. *Allpanchis* 18 (1986) 27: 149 - 178
- Burns, R.E. 1993. Irrigated rice culture in monsoon Asia: The search for effective water control technology. *World Development* 21 (1993) 5, pp. 771-789.
- Burt, Charles M. 1999. Current Canal Modernization From an International Perspective. *Proceedings 1999 USCID Workshop: Modernization of Irrigation Water Delivery Systems*. Denver, USA: US Committee on Irrigation and Drainage, pp. 15-37
- Bustamante, Rocio, Elizabeth Peredo and Norma del Pozo. 2004. Women in the "Water War" in the Cochabamba Valleys. In: Vivienne Bennett, Sonia Dávila Poblete and Maria Nieves Rico (eds.), *Opposing Currents. The Politics of Water and*

- Gender in Latin America*. Pittsburgh, USA: University of Pittsburgh Press, pp. 72 – 90
- Butler, Judith. 1999. *Gender Trouble*. New York, U.S.A and London, U.K.: Routledge. (Second revised edition).
- Butler, Judith. 1995. Contingent Foundations. In: Seyla Benhabib, Judith Butler, Drucilla Cornell and Nancy Fraser. *Feminist Contentions. A philosophical exchange*. New York, USA and London, UK: Routledge, pp.35-58
- Buvinic, Mayra, Margaret Lycette and William P. Mc Greevey (eds.). 1983. *Women and Poverty in the Third World*. Baltimore, USA: John Hopkins University Press.
- Cáceres, Efraín. 2002. *El Juicio del Agua – ‘Una Huishu’. Simbolismo y significado ecológico del agua en mitos andinos*. Quito, Ecuador: Abya-Yala.
- Cadena, Marisol de la. 1985. La comunera como productora: trabajo de mujer por trabajo de hombre. *Allpanchis* 25 (1985) 21. Cusco, Peru: Instituto Pastoral Andino.
- Cadena, Marisol de la. 1996. Las mujeres son más indias. In: Patricia Ruiz-Bravo (ed.), *Detrás de la puerta. Hombres y mujeres en el Peru de hoy*. Lima, Peru: Pontificia Universidad Católica del Peru, pp. 181 - 217
- Campillo, F. 1993. Género y desarrollo. Las mujeres del campo y la producción agrícola. *Ruralter* 11/12. Lima, Peru/La Paz, Bolivia/ Montreuil, France: CICDA.
- Carafa, Y. 1993. Una aproximación a la construcción de género en el mundo rural andino. *Ruralter* 11/12. Lima, Peru/La Paz, Bolivia/ Montreuil, France: CICDA.
- Carney, Judith A.. 1986. *The Social History of Gambian Rice Production: An analysis of Food Security Strategies*. PhD Thesis. Berkeley, U.S.A.: University of California.
- Carney, Judith. 1988a. Struggles over crop rights and labor within contract farming households in a Gambian irrigated rice project. *The Journal of Peasant Studies* 15 (1988) 3, pp. 334-349
- Carney, Judith. 1988b. Struggles over land and crops in an irrigated rice scheme: The Gambia. In: Jean Davison (ed.), *Agriculture, women and land. The African experience*. Boulder, Colorado, USA: Westview Press, pp. 59–78
- Carney, Judith. 1992. Peasant Women and Economic Transformation in The Gambia. *Development and Change* 23 (1992): pp. 67-90.
- Carney, Judith. 1993. Converting the Wetlands, Engendering the Environment. The Intersection of Gender with Agrarian Change in the Gambia. *Economic Geography* 69 (1993) 4, pp. 329 - 348
- Carney, Judith. 1994. Gender and the sustainability of irrigated farming in The Gambia. In ed. Ingrid Yngstrom, Patricia Jeffery, Kenneth King and Camilla Toulmin (eds.), *Gender and environment in Africa. Perspectives on the politics of environmental sustainability*. Edinburgh, UK: Centre of African Studies, University of Edinburgh.
- Carney, Judith. 1996. Converting the Wetlands, Engendering the Environment: The Intersection of Gender with Agrarian Change in The Gambia. In: R. Peet and M. Watts (eds.) *Liberation Ecologies: Environment, Development, Social Movements*. London, UK: Routledge, pp. 165-187.

- Carney, Judith. 1998. Women's land rights in Gambian irrigated rice schemes: Constraints and opportunities. *Agriculture and Human Values* 15 (1998) 4, pp. 325-336
- Carney, Judith and M. Watts. 1991. Disciplining women? Rice, mechanization, and the evolution of Mandinka gender relations in Senegambia. *Signs* 16 (1991) 4: 651-681
- Cixous, Hélène and Cathérine Clément. 1986. *The Newly Born Woman*. Minneapolis, USA: Univesrity of Minnesota Press.
- Chambers, Robert. 1977. Man and Water: The Organization and Operation of Irrigation. In: B.H. Farmer (ed.), *Green Revolution? Technology and Change in Rice-Growing Areas of Tamil Nadu and Sri Lanka*. Boulder, Colorado: Westview Press, pp. 340-363
- Chambers, Robert. 1980. Basic Concepts in the Organization of Irrigation. In: E. Walter Coward, Jr. (ed.), *Irrigation and Agricultural Development in Asia. Perspectives from the Social Sciences*. Ithaca, New York: Cornell University Press, pp.28-50
- Chambers, Robert. 1988. *Managing Canal Irrigation: A practical Analysis from South Asia*. New Delhi: Oxford and IBH Publishing.
- Chidenga, E. E. 2003. *Leveraging water delivery. Irrigation technology choices and operations and maintenance in smallholder systems in Zimbabwe*. PhD Thesis. Wageningen: Wageningen Agricultural University.
- Chimedza, Ruvimbo. 1989. *The impact of irrigation development on women farmers in Zimbabwe*. Rome, Italy: FAO.
- Cernea, Michael M and Ruth Meinzen-Dick. 1994. *Design for water user associations: organisational characteristics*. Irrigation Management Network Paper 30. London: Overseas Development Institute
- Cleaver Francis and Diane Elson. 1995. *Women and water resources: Conitnued marginalization and new policies*. Gatekeeper Series No. 49. London, U.K.: International Institute for Environment and Development (IIED).
- Cleaver, Frances. 1999. Paradoxes of Participation: questioning participatory approaches to development. *Journal of International Development* 11 (1999) 4: 597-612
- Cleaver, Frances. 2000. Moral Ecological Rationality, Institutions and the Management of Common Property Resources. *Development and Change* 31 (2000), pp. 361-383
- Cockburn, Cynthia. 1985. *Machinery of dominance: Women, men and technical know-how*. London, U.K.: Pluto.
- Coles, Anne and Tina Wallace (eds.). 2005. *Gender, Water and Development*. Oxford, UK and New York, USA: Berg.
- CONAIE. 1996. *Propuesta Ley de Aguas*. Quito, Ecuador: CONAIE,
- Conti, Anna. 1979. Women on "Schemes" in Upper Volta. *Review of African Political Economy* 15/16 (1979), pp. 75 - 92

- Connell, Robert W. 1987. *Gender and Power. Society, the Person and Sexual Politics*. Cambridge, UK: Polity Press.
- Connell, Robert W. 1995. *Masculinities*. Berkeley, Los Angeles, USA: University of California Press.
- Coward, E. Walter, Jr. (ed.). 1980. *Irrigation and Agricultural Development in Asia: Perspectives from the Social Sciences*. Ithaca: Cornell University Press.
- Coward, E. Walter, Jr. and Gilbert Levine. 1986. Studies of Farmer-Managed Irrigation Systems: Ten Years of Cumulative Knowledge and Changing Research Priorities. Keynote paper prepared for Workshop Public Intervention in Farmer-Managed Irrigation Systems. Kathmandu, Nepal: IIMI.
- Coward, R. 1983. *Patriarchal Precedents*. London, UK: Routledge & Kegan Paul.
- Davidson, Arnold I. 1986. Archeology, Genealogy, Ethics. In: David Couzens Hoy (ed.), *Foucault. A Critical Reader*. Oxford, UK and Cambridge, USA: Blackwell, pp. 221-233
- Deere, Carmen Diana and Magdalena León (eds.) 1987. *Rural Women and State Policy: Feminist Perspectives on Agricultural Development in Latin America*. Boulder, Colorado, USA: Westview Press.
- Deere, Carmen Diana and Magdalena de León. 2001. *Género, Propiedad y Empoderamiento: tierra, Estado y Mercado en América Latina*. México, D.F., México: UNAM and Quito, Ecuador: FLACSO.
- Delphy, C. 1977. *The Main Enemy*. London, U.K.: Women's Research and Resources Centre.
- Derrida, Jacques. 1976. *Of Grammatology*. Translated by Gayatri Chakravorty Spivak. Baltimore: The John Hopkins Press. (De la grammatologie. Paris: Minuit, 1976.)
- Dey, Jennie. 1981. Gambian women: Unequal partners in rice development projects? *Journal of Development Studies* 17 (1981) 3, pp. 109-122
- Dey, Jennie. 1982. Development planning in the Gambia: the gap between planners and farmers' perceptions, expectations and objectives. *World Development* 10 (1982) May, pp. 377-396
- Dey, Jennie. 1990. Gender Issues in irrigation project design in Sub-Saharan Africa. *Contributions to the International Workshop "Design for Sustainable Farmer-Managed Irrigation Schemes in Sub-Saharan Africa"*. February 1990. Wageningen, The Netherlands: Wageningen Agricultural University.
- Diemer, Geert. 1990. *Irrigatie in Afrika. Boeren en ingenieurs, techniek en cultuur*. Amsterdam, The Netherlands: Thesis Publishers.
- Diemer, Geert and Jacques Slabbers (eds.) 1992. *Irrigators and Engineers*. Amsterdam, The Netherlands: Thesis Publishers.
- Diemer, Geert and Linden Vincent. 1992. Irrigation in Africa: The Failure of Collective Memory and Collective Understanding. *Development Policy Review*, 10 (1992), pp.131 - 154
- Dietz, Mary. 1992. Context is all: Feminism and Theories of Citizenship. In: Chantal Mouffe (ed.) *Dimensions of Radical Democracy. Pluralism, Citizenship and Community*. London, UK and New York, USA: Verso, pp. 63-85

- DISC, 1990. *Introductions and contributions to the international workshop 'Design for sustainable farmer-managed irrigation schemes in sub-Saharan Africa'*. Volumes 1 & 2. Department of Irrigation and Soil and Water Conservation (DISC). Wageningen, The Netherlands: Wageningen Agricultural University.
- Drunen, H. van. 2000. Personal communication, October, 2000.
- Edmunds, David and Eva Wollenberg. 2001. A Strategic Approach to Multistakeholder Negotiations. *Development and Change* 32 (2001), pp. 231-253
- Eggink, J.W. and J. Ubels. 1984. *Irrigation, peasants and development. An attempt to analyse the role of irrigation in social change in Third World societies*. Wageningen: Agricultural University.
- Ekejiuba, Felicia I. 1995. Down to fundamentals: Women-centred Hearths-holds in Rural West-Africa. In: Deborah Fahy Bryceson (ed.), *Women wielding the hoe. Lessons from Rural Africa for Feminist Theory and Development Practice*. Oxford, U.K. and Washington D.C., U.S.A.: Berg Publishers, pp. 47-62
- Elson, Diane. 1998. Talking to the boys: gender and economic growth models. In: Cecile Jackson and Ruth Pearson (eds.), *Feminist visions of development. Gender analysis and Policy*. London and New York: Routledge, pp. 155 -170.
- Endeveld, Marina and M. Zwarteveen. 1995. Rural Women's Questions are Agrarian Questions. A discussion of the intellectual and political construction of realities of rural women. In: Agrarian Questions' Organizing Committee (eds.), *Agrarian Questions. The Politics of Farming anno 1995*. Wageningen, The Netherlands, pp. 1886-1896
- Engels, Friedrich. 1976 (first published in 1884). *De oorsprong van het gezin, van de partikuliere eigendom en de staat*. Amsterdam, The Netherlands: Pegasus.
- FAO. 1982. *Guidelines Women in Land and Water Development*. Rome, Italy: Land and Water Development Division, FAO.
- FAO. 1998. *Rural women and food security: current situation and perspectives*. Rome, Italy: Food and Agriculture Organization of the United Nations.
- FAO. 2001. *Smallholder irrigation technology: prospects for sub-Saharan Africa*. IFPRI Knowledge Synthesis Report No. 3. Rome, Italy: FAO.
- Faulkner, Wendy. 2000. The Power and the Pleasure. A Research Agenda for "Making Gender Stick" to Engineers. *Science, Technology and Human Values* 25 (2000) 1, pp. 88-120
- Ferguson, E. 1993. *Engineering and the Mind's Eye*. Cambridge, Massachusetts, U.S.A.: MIT Press.
- Folbre, Nancy. 1986. Hearts and Spades: Paradigms of Household Economics. *World Development* 14 (1986) 2, pp. 245-255
- Folbre, Nancy (ed.). 1996. *The Economics of the Family*. Cheltenham, U.K. and Brookfield, Vermont, U.S.A: Edward Elgar Publishing Ltd.
- Foucault, Michel. 1990. *The History of Sexuality. An Introduction*. Volume 1. Translated by Robert Hurley. New York: Vintage (First published in 1978).
- Foucault, Michel. 1979. *Discipline and Punish*. New York: Vintage.

- Foucault, Michel. 1984. Nietzsche, genealogy, history. In: Paul Rabinow (ed.), *The Foucault Reader*. New York, U.S.A.: Pantheon Books, Random House, Inc., pp.76-100
- Francis, Jennifer and Sybille Jahn. 2001. Integrating Gender Perspectives: Realising New Options for Improved Water Management. Presentation at the International Conference on Freshwater, Bonn, 2001.
- Francke, J. 1993. *Mujer y riego*. Mimeo. Cayambe, Ecuador: IEDECA.
- Fraser, Nancy. 1989. *Unruly practices: power, discourse and gender in contemporary social theory*. Cambridge, UK: Polity Press.
- Fraser, Nancy. 1997. *Justice Interruptus. Critical Reflections on the "Postsocialist" Condition*. New York and London: Routledge.
- Fraser, Nancy. 2000. Rethinking recognition. *New Left Review* 3 (2000) 3: 107-120
- Fraser, Nancy and Linda Nicholson. 1990. Social criticism without philosophy: an encounter between feminism and postmodernism. In: Linda Nicholson (ed.), *Feminism/Postmodernism*. New York, USA: Routledge, pp. 19-38
- Frederiksen, H.D. 1996. Water crisis in the developing world: Misconceptions about solutions. *Journal of Water Resources Planning and Management*. March/April 1996, pp. 79-87
- Freeman, David M. and Max K. Lowdermilk. 1985. Middle-Level Farmer Organizations as Links between Farms and Central Irrigation Systems. In: Michael Cernea (ed.), *Putting People First. Sociological Variables in Rural Development*. Washington, D.C., USA: World Bank.
- Friedman, Marilyn. 2000. Feminism in ethics. Conceptions of autonomy. In: Miranda Fricker and Jennifer Hornsby. *The Cambridge Companion to Feminism in Philosophy*. Cambridge, UK: The Cambridge University Press.
- Gautam, Suman. 2005. *Incorporating Groundwater Irrigation. Technology Dynamics and Conjunctive Water Management in the Nepal Terai*. Wageningen University Water Resources Series. Hyderabad, India: Orient Longman.
- Gelles, Paul H. 2000. *Water and power in highland Peru: the Cultural Politics of Irrigation and Development*. New Brunswick, New Jersey, USA and London, UK: Rutgers University Press.
- Gelles, Paul H. and Rutgerd Boelens. 2003. Water, community and identity: The Politics of Cultural and Agricultural Production in the Andes. In: Ton Salman and Annelies Zoomers (eds.), *Imaging the Andes: Shifting Margins of a Marginal World*. Amsterdam and Leiden, The Netherlands: Aksant, CEDLA, pp. 123-144
- Gerbrandy, Gerben and Paul Hoogendam. 1998. *Aguas y Acequias*. Cochabamba, Bolivia: PEIRAV/Plural Editores.
- Giddens, Anthony. 1979. *Central Problems in Social Theory. Action, Structure and Contradiction in Social Analysis*. Berkeley, California, USA: University of California Press.
- Giddens, Anthony. 1984. *The Constitution of Society. Outline of a theory of structuration*. Cambridge, UK: Polity Press.

- Gilmartin, David. 1994. Scientific Empire and Imperial Science: Colonialism and Irrigation Technology in the Indus Basin. *The Journal of Asian Studies* 53 (1994) 4, pp. 1127-1149
- Gilmartin, David. 2003. Water and Waste: Nature, Productivity and Colonialism in the Indus Basin. *Economic and Political Weekly* 29 (2003), pp.1-19
- Granovetter, Mark. 1992. Economic Action and Social Structure: The Problem of Embeddedness. In: Mark Granovetter and R. Swedburg (eds.), *The Sociology of Economic Life*. Oxford, UK: Westview Press, pp. 53-81
- Green, C. and Baden, S. 1995. Integrated water resource management: A gender perspective. *IDS Bulletin* 26 (1995)
- Grift, Eveline van. 1991. *Gender relations in traditional irrigation in Malolo, Tanzania*. MSc Thesis. Wageningen, The Netherlands: Wageningen Agricultural University.
- Grillo, Eduardo. 1994. *Género y desarrollo en los Andes*. Lima, Peru: PRATEC.
- Grillo, R. 1997. Discourses of Development: The view from Anthropology, in R. Grillo and R.L. Stirrat (eds) *Discourses of Development: Anthropological Perspectives*, Oxford, UK: Berg: pp.1-33
- GTZ. 1996. *Gender issues in irrigation management. Evaluation of experiences and recommendations for implementation*. Eschborn, Germany: GTZ.
- Gutiérrez, Zulema and Sylvia E. Cardona. 1998. *Las relaciones de género en la gestión de aguas en sistemas de producción intensiva: Estudios de caso Combuayo, Vinto, Cochabamba*. Cochabamba, Bolivia: PEIRAV.
- Gutiérrez, Zulema. 2004. Personal communication.
- Guyer, Jane I. 1984. Naturalism in Models of African Production. *Man* 19 (1984) 4, pp. 371-388
- Guyer, Jane I. and Pauline E. Peters. 1987. Conceptualizing the Household: Issues of theory and Policy in Africa. *Development and Change* 18 (1987) 2, pp. 197-214
- Guyer, Jane I. 1995. Women's Farming and Present Ethnography: Perspectives on a Nigerian Restudy. In: Deborah Fahy Bryceson (ed.), *Women Wielding the Hoe. Lessons from Rural Africa for Feminist Theory and Development Practice*. Oxford, U.K and Washington, D.C., U.S.A.: Berg Publishers, pp. 25-46
- GWA. 2003a. *Tapping into Sustainability: issues and trends in gender mainstreaming in water and sanitation*. A background document for the Gender and Water Session, 3rd World Water Forum, Kyoto, Japan, 2003. Delft, The Netherlands, GWA Secretariat, IRC.
- GWA. 2003b. *Gender Perspectives on Policies in the Water Sector*. The Gender and Water Development Report 2003. Delft, The Netherlands: GWA Secretariat. (Also available at <http://www.genderandwateralliance.org>)
- Hacking, Ian. 1986. The archaeology of Foucault. In: David Couzens Hoy (ed.), *Foucault. A Critical Reader*. Oxford, UK and Cambridge, USA: Blackwell, pp. 27 - 40

- Halsema, Gerardo E. van. 2002. *Trial and Re-trial. The Evolution of Irrigation Modernisation in NWFP, Pakistan*. PhD Thesis. Wageningen, The Netherlands: Wageningen University.
- Hanger, Jane and Jon Moris. 1973. Women and the household economy. In: Chambers, Robert and Jon Moris (eds.), *Mwea, An Irrigated Rice Settlement in Kenya*. München, Germany: Weltforum Verlag, pp.209-237
- Haraway, Donna J. 1991. *Simians, Cyborgs and Women. The Reinvention of Nature*. London, U.K.: Free Association Books.
- Haraway, Donna. 2003. *The Companion Species Manifesto. Dogs, people and significant otherness*. Chicago, USA: Prickly Paradigm Press.
- Hardin, Garreth. 1968. The Tragedy of the Commons. *Science* 162 (1968): 1243-1248
- Harding, Sandra. 1986. *The Science Question in Feminism*. Ithaca, USA and London, UK: Cornell University Press.
- Harris, Olivia. 1985. Complementaridad y conflicto. Una vision andina del hombre y la mujer. *Allpanchis* 25 (1985) 21: 17-42
- Harriss, John. 1977. Problems of Water Management in Hambantota District. In: B.H. Farmer (ed.), *Green Revolution? Technology and Change in Rice-Growing Areas of Tamil Nadu and Sri Lanka*. Boulder, Colorado: Westview Press pp. 364-376
- Hart, Gillian. 1992. Household production reconsidered: Gender, labor conflict and technological change in Malaysia's Muda region. *World Development* 20 (1992) 6: 809-823
- Hartmann, H. 1979. The unhappy marriage of Marxism and Feminism: towards a more progressive Union. *Capital and Class* 1979 (8), pp. 1-33
- Hartsock, N. C.M. 1998. *The Feminist Standpoint Revisited & Other Essays*. Boulder, Colorado, USA: Westview Press.
- Held, D. 1995. *Democracy and the global order: from the modern state to cosmopolitan governance*. Cambridge, UK: Polity Press.
- Helsloot, L. 1990. A contribution towards design of women-managed irrigation. In: DISC (ed.), *Introductions and contributions to the international workshop 'Design for sustainable farmer-managed irrigation schemes in sub-Saharan Africa*. Volumes 1 & 2. Department of Irrigation and Soil and Water Conservation (DISC). Wageningen, The Netherlands: Wageningen Agricultural University, pp. 2G.
- Hendriks, Jan. 2002. Water rights and strengthening users' organisations: the art of negotiating. Challenges for institutions assisting community irrigation in the Andes. In: Rutgerd Boelens and Paul Hoogendam (eds.) *Water rights and empowerment*. Assen, The Netherlands, Van Gorcum, pp. 52- 74
- Hilhorst, Thea. 2000. *Records and Reputations. Everyday Politics of a Philippine Development NGO*. PhD Thesis. Wageningen: Wageningen University.
- Hobson, S. 1983. *The Lost Harvest*. BBC Documentary.
- Hoof, I. van. 1990. Irrigation Planning for Women: The Planning Process of the Jahally-Pacharr Project in the Gambia. Contribution to the International Workshop "Design for Sustainable Farmer-Managed Irrigation Schemes In Sub-

- Saharan Africa." Wageningen Agricultural University, The Netherlands, 5-8 February, 1990. Wageningen: Wageningen Agricultural University.
- Horst, Lucas. 1998. *The Dilemma's of Water Division. Consideration and Criteria for Irrigation System Design*. Colombo, Sri Lanka: International Water Management Institute and Wageningen, The Netherlands: Wageningen Agricultural University.
- Horst, Lucas. 2001. FMIS and Technology. Key Note Speech. In: Upendra Gautam and Shrish Rana (eds.), *Challenges to Farmer Managed Irrigation Systems*. Proceedings of International Seminar on Challenges to Farmer Managed Irrigation Systems held on 28 and 29 March 2000, Kathmandu. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust.
- Hulsebosch, Joitske and Doris Ombara. 1995. Towards gender balance in irrigation management: experiences in Kenya South West Kano project. *Irrigation and Drainage Systems* 9 (1995), pp. 1-14
- Huntington, S. 1975. Issues in women's role in economic development: Critique and alternatives, *Journal of Marriage and the Family* 37(1975) 4.
- IIAV. 2000. *Gender 21: Women's recommendations to the 2nd ministerial conference on water*. Amsterdam, The Netherlands: IIAV.
- IIMI. 1987. *Public Intervention in farmer-managed irrigation systems*. Colombo, Sri Lanka: IIMI.
- International Conference on Water and the Environment. 1992. Development Issues for the 21st Century. The Dublin Statement Report of the Conference. *ICWE Conference*, January 26-31, Dublin, Ireland.
- Irigaray, Luce. 1981 (1977). *Dit geslacht dat niet (één) is*. Amsterdam, The Netherlands : Stichting Hölderlin. (Original title : 1977. *Ce sexe qui n'en est pas un*, Paris, France: Minit)
- Jackson, Cecile. 1985. *The Kano River Irrigation Project*. West Hartford, Connecticut, USA: Kumarian Press (Women's Roles and Gender Differences in Development # 4).
- Jackson, Cecile. 1993a. Doing what comes naturally? Women and environment in development. *World Development* 21 (1993) 12, pp. 1974-1963
- Jackson, Cecile. 1993b. Women/Nature or Gender/History? A Critique of Ecofeminist 'Development'. *The Journal of Peasant Studies* 20 (1993) 3, pp. 389-419.
- Jackson, Cecile. 1998a. Gender, Irrigation and Environment: Arguing for Agency. *Agriculture and Human Values* 15 (1998) 4, pp. 313-324
- Jackson, Cecile. 1998b. Social Exclusion and Gender: Does One Size fit All? Mimeo. Norwich, UK: School of Development Studies, University of East-Anglia.
- Jackson, Cecile. 2002. Disciplining Gender? *World Development* 30 (2002) 3: 497-509
- Jácome, Rosario and Marion Krol. 1994. *Nosotras también surqueamos, cantaremos y regamos. Relaciones de género en el riego en el Proyecto Pungales*. Riobamba, Bolivia: CESA.
- James, Wendy. 1978. Matrifocus on African Women. In: Shirley Ardener (ed.), *Defining Females*. London, UK: Croom Helm, 227 p.

- Jaquette, J. 1990. Gender and justice in economic development. In: Irene Tinker (ed.), *Persistent Inequalities*, Oxford, UK: Oxford University Press, pp. 54-82
- Jarayaman, T.K. 1981. Farmers' organizations in surface irrigation project: two empirical studies from Gujarat. *Economic and Political Weekly* 16 (1981), pp. A89 - A98
- Jha, Nitish. 2004. Gender and decisionmaking in Balinese agriculture. *American Ethnologist* 31 (2004) 4: 51 -75
- Jones, Christine W. 1986. Intra-household bargaining in response to the introduction of new crops: A case study from north Cameroon. In: Mook, J.L. (ed.), *Understanding Africa's Rural Households and Farming Systems*. Boulder, Colorado, USA: Westview Press, pp. 105-123
- Jordans, Eva H. and Margreet Z. Zwarteveen. 1997. *A well of one's own. Gender Analysis of an Irrigation Program in Bangladesh*. Bangladesh Country Report 1. Colombo, Sri Lanka: IIMI.
- Joshi Neeraj N., Elinor Ostrom, Ganesh P. Shivakoti, and Wai Fung Lam. 2000. Institutional opportunities and constraints in the performance of Farmer Managed Irrigation Systems in Nepal. *Asia-Pacific Journal of Rural Development*, 10/2 December.
- Kabeer, Naila. 1991. *Gender, Production and Well-Being: Rethinking the Household Economy*. IDS Discussion Paper 288. Brighton. U.K.: Institute of Development Studies.
- Kabeer, Naila. 1995. *Reversed Realities. Gender hierarchies in Development Thought*. New Delhi, India: Kali for Women (Also published by London, U.K.: Verso, New Left Books.)
- Kandiyoti, Deniz. 1998. Gender, power and contestation. Rethinking bargaining with patriarchy. In: Cecile Jackson and Ruth Pearson (eds.), *Feminist visions of Development. Gender, Analysis and Policy*. London, U.K. and New York, U.S.A.: Routledge, pp.135-151
- Kevane, Michael and Leslie C. Gray. 1999. A Woman's Field is Made at Night: Gendered Land Rights and Norms in Burkina Faso. *Feminist Economics* 5(1999) 3, pp. 1-26
- Khanal, Puspa Raj. 2003. *Engineering Participation. The Process and Outcomes of Irrigation Management Transfer in the Terai of Nepal*. Wageningen University Water Resources Series. Hyderabad, India: Orient Longman.
- Kloezen, Wim H. 2002. *Accounting for water, Institutional viability and impacts of market-oriented irrigation interventions in Central Mexico*. PhD Thesis. Wageningen, The Netherlands: Wageningen University.
- Kome, Antoinette. 1997. *Gender and Irrigation Management Transfer in Sri Lanka*. M Sc Thesis. Colombo, Sri Lanka: Irrigation Research Management Unit, International Irrigation Management Institute and the Irrigation Department; Wageningen, The Netherlands: Department of Gender Studies in Agriculture and Department of Irrigation.

- Koppen, van, Barbara. 1990. Women and the design of farmer-managed irrigation schemes: Experiences provided by two projects in Burkina Faso. In: Contributions to the International Workshop "Design for Sustainable Farmer-Managed Irrigation Schemes in Sub-Saharan Africa", February 1990. Wageningen, The Netherlands: Wageningen Agricultural University.
- Koppen, van, Barbara. 1998a. *More jobs per drop: Targeting irrigation to poor women and men*. Amsterdam, The Netherlands: Royal Tropical Institute.
- Koppen, van, Barbara. 1998b. Water rights, gender and poverty alleviation. Inclusion and exclusion of women and men smallholders in public irrigation infrastructure development. *Agriculture and Human Values* 15 (1998) 4, pp. 361-374
- Koppen, van, Barbara. 2000. Gendered Water and Land Rights in Rice Valley Improvement, Burkina Faso. In: B.R. Bruns and R.S. Meinzen-Dick (eds.), *Negotiating Water Rights*. Washington D.C., USA: IFPRI and New Delhi, India: Vistaar Publications, pp. 83-111
- Koppen, van, Barbara, Jacobijn van Etten, Prabina Bajracharya and Amita Tuladhar. 2001. *Women irrigators and leaders in the West-Gandak Scheme in Nepal*. IWMI Working Paper no. 15. Colombo, Sri Lanka: IWMI.
- Kortenhorst, L.F., Van Steekelenburg, P.N.G., and L.H. Sprey. 1989. Prospects and problems of irrigation development in Sahelian and sub-Saharan Africa. *Irrigation and Drainage Systems* 3 (1989), pp. 13-45
- Kooyman, M. 1990. The impact of farming systems on irrigated rice development projects: the Jahaly Pacharr smallholder irrigation project, the Gambia. In: DISC (ed.), *Introductions and contributions to the international workshop 'Design for sustainable farmer-managed irrigation schemes in sub-Saharan Africa*. Volumes 1 & 2. Department of Irrigation and Soil and Water Conservation (DISC). Wageningen, The Netherlands: Wageningen Agricultural University, pp. 1E.
- Krol, M. 1994. *Irrigatie is mannenwerk. Genderverhoudingen in een kleinschalig irrigatieproject in de Ecuatoriaanse Andes*. MSc thesis. Wageningen, The Netherlands: Wageningen Agricultural University.
- Kumar, Shanti P. 1987. The Mahaweli Scheme and rural women in Sri Lanka. In: Heyzer, Noeleen (ed.), *Women Farmers and Rural Change in Asia*. Kuala Lumpur, Malaysia: Asia and Pacific Development Center (APDC), pp. 220-253
- Lam, W.F. 1994. Statistical analysis of irrigation performance in Nepal. In: Paul Benjamin, Wai Fung Lam, Elinor Ostrom and Ganesh Shivakoti (eds.), *Institutions, Incentives and Irrigation in Nepal*. Report prepared for the US Agency for International Development, Global Bureau Democracy Center.
- Langton, Rae. 2000. Feminism in Epistemology. Exclusion and objectification. In: Miranda Fricker and Jennifer Hornsby (eds.), *The Cambridge Companion to Feminism in Philosophy*. Cambridge, UK, pp. 127-145
- Lastarria-Cornhiel, S. 1997. Impact of privatization on gender and property rights in Africa. *World Development* 25 (1997) 8, pp. 1317 - 1334

- Latour, Bruno. 1987. *Science in Action. How to follow scientists and engineers through society*. Cambridge, Massachusetts, U.S.A.: Harvard University Press.
- Laurie, Nina and Sarah Radcliffe. 2001. The transnationalization of gender and re-imagining Andean indigenous development. Paper presented at the Panel "Re-imagining Gender and Development in the Americas", Latin America Studies Association 2001.
- Law, John. 1994. *Organizing Modernity*. Oxford, U.K.: Blackwell Publishers.
- Leacock, Eleanor. 1981. *Myths of Male Dominance*. New York: USA: Monthly Review Press.
- Leacock, Eleanor and M. Etienne. 1980. *Women and Colonization: Anthropological Perspectives*. New York, USA: Praeger Publishers.
- Levine, Gilbert and E. Walter Coward Jr. 1989. *Equity considerations in the modernization of irrigation systems*. ODI Irrigation Management Network Newsletter. London: Overseas Development Institute.
- Le Vu, Sophie. 1994. Contribution au Diagnostic Social du Périmètre de Dakiri. Analyse des données quantitatives. Internal report. Ouagadougou, Burkina Faso: IIMI.
- Long, Norman. 1992. From paradigm lost to paradigm regained? The case for an actor-oriented sociology of development. In: Norman Long and Anne Long (eds.), *Battlefields of Knowledge. The Interlocking of Theory and Practice in Social Research and Development*. London, UK and New York, USA: Routledge.
- Long, N. and van der Ploeg, J.D. 1989. Demythologizing Planned Intervention: An Actor Perspective. *Sociologia Ruralis* XXXIX 3 (1989) 4, pp. 226-249.
- Longino, Helen. 1990. *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry*. Princeton, New Jersey, USA: Princeton University Press.
- Luckham, Robin, Anne Marie Goetz, Mary Kaldor, with: Alison Ayers, Sunil Bastian, Emmanuel Gyimah-Boadi, Shireen Hassim and Zarko Puhovski. 2000. *Democratic institutions and politics in contexts of inequality, poverty and conflict. A conceptual framework*. IDS Working Paper 104. Brighton, UK: IDS.
- Lund, R. 1978. *A survey on Women's Working and Living Conditions in a Mahaweli Settlement Area with Special Emphasis on Household Budgets and Household Surplus*. Colombo, Sri Lanka: People's Bank.
- Lynch Deutch, B. 1991. Women and irrigation in highland Peru. *Society and Natural Resources* 4 (1991), pp. 37-52.
- Lynch, Barbara D. 1993. The Bureaucratic Tradition and Women's Invisibility in Irrigation. *Proceedings of the 24th Chacmool Conference*. Alberta: University of Calgary, Archeological Association, pp. 333-342
- Mabry, J.B. and D.A. Cleveland. 1996. The relevance of indigenous irrigation: A comparative analysis of sustainability. In: J.B. Mabry (ed.), *Canals and Communities. Small-scale irrigation systems*. Tucson, USA: University of Arizona Press, pp. 227-260.
- Maharaj, N. 2003. *The Gender approach to Water Management. Lessons Learnt Around the Globe*. Findings of an electronic conference series convened by the Gender and

- Water Alliance. Delft, The Netherlands: GWA Secretariat. Also available at <http://www.genderandwateralliance.org>
- Manzungu, Emmanuel. 1999. *Strategies for smallholder irrigation management in Zimbabwe*. PhD Thesis, Wageningen: Wageningen Agricultural University.
- Mayer, Enrique. 2002. *The Articulated Peasant. Household Economies in the Andes*. Boulder, Colorado, USA and Oxford, UK: Westview Press.
- Mayoux, Linda. 1995. Beyond Naivety: Women, Gender Inequality and Participatory Development. *Development and Change* 26 (1995), pp. 235-258
- McCay B.J. and S. Jentoft. 1998. Market or Community Failure? Critical Perspectives on Common Property Research. *Human Organization* 57 (1), pp. 21-29
- Mc Nay, Lois. 1992. *Foucault and feminism. Power, Gender and the Self*. Boston, USA: Northeastern University Press.
- Meier, Didrik. 2000. Gestión del agua en los Andes. Estudio de caso de los sistemas Quillunza-Huambo y Cotohuasi-Perú. Msc Thesis, Wageningen University.
- Meinzen-Dick, Ruth, R.A. Manzardo and R. Reidinger. 1995. *Participation in irrigation*. Environment Department Participation Series Paper No. 3. Washington D.C., USA: The World Bank.
- Meinzen-Dick, Ruth and Margreet Zwarteveen. 1998. Gendered Participation in Water Management: Issues and Illustrations from Water Users' Associations in South Asia. *Agriculture and Human Values* 15 (1998) 4, pp. 337-345
- Meinzen-Dick, Ruth and Margreet Zwarteveen. 2001. Gender Dimensions of Community Resource Management. The Case of Water Users' Associations in South Asia. In: Arun Agrawal and Clark C. Gibson (eds.). 2001. *Communities and the Environment. Ethnicity, Gender and the State in Community-Based Conservation*. New Brunswick, New Jersey, USA and London, UK: Rutgers University Press: 63 - 88
- Merchant, Carolyn. 1995. *Earthcare. Women and the Environment*. London, UK: Routledge.
- Merrey, Douglas J. 1983. *Irrigation, poverty and social change in a village of Pakistani Punjab: an historical and cultural ecological analysis*. PhD Thesis. Philadelphia, USA: University of Pennsylvania.
- Merrey, Douglas J. 1996. *Institutional design principles for accountability in large irrigation systems*. Research Report No. 8. Colombo, Sri Lanka: IIMI.
- Mies, Maria. 1988. Social Origins of the Sexual Divisions of Labour. In: Maria Mies, Veronika Bennholdt Thomsen and Claudia von Werlhof (eds.), *Women: The Last Colony*. London, UK: Zed Books Ltd, pp.67-95. (First published as: Mies, Maria. 1980. *Gesellschaftliche Ursprünge der geschlechtlichen Arbeitsteilung. Beiträge zur feministischen Theorie und Praxis 3: Frauen und 'dritte' Welt*. München, Germany, pp. 61-78)
- Mies, Maria. 1986. *Patriarchy and Accumulation on a World Scale. Women in the International Division of Labor*. London, U.K.: Zed Books

- Miller, Carol and Shara Razavi. 1998. *Missionaries and Mandarins. Feminist Engagement with development institutions*. London, UK: Intermediate Technology Publications.
- Mitchell, C. 1971. *Women's Estate*. Harmondsworth, UK: Penguin.
- Minh-ha, Trinh T. 1989. *Women, Native, Other. Writing Postcoloniality and Feminism*. Indiana, USA: Indiana University Press.
- Minnich, Elizabeth Kamarck. 1990. *Transforming Knowledge*. Philadelphia, U.S.A: Temple University Press.
- Mohanty, Chandra Talpade. 1991. Under Western Eyes: Feminist Scholarship and Colonial Discourses. In: Chandra Talpade Mohanty, Ann Russo and Lourdes Torres (eds.), *Third World Women and the Politics of Feminism*. Bloomington and Indianapolis, USA: Indiana University Press, pp. 51-78
- Molden, David, R. Sakthivadivel, Christopher J. Perry, Charlotte de Fraiture and Wim H. Kloezen. 1998. *Indicators for Comparing Performance of Irrigated Agricultural Systems*. Research Report No. 20. Colombo, Sri Lanka: IWMI.
- Mollinga, Peter and Linden Vincent. 1996. *Reader Irrigation and Development*. Wageningen, The Netherlands: Wageningen University, IWE.
- Mollinga, Peter P. 1998. *On the Waterfront. Water distribution, technology and agrarian change in a South Indian canal irrigation system*. PhD thesis. Wageningen, The Netherlands: Wageningen Agricultural University.
- Mollinga, Peter and Alex Bolding. 2004. *The Politics of Irrigation Reform. Contested Policy Formulation and Implementation in Asia, Africa and Latin America*. Aldershot, UK and Burlington, USA: Ashgate.
- Molyneux, Maxine. 2002. Gender and the Silences of Social Capital: Lessons from Latin America. *Development and Change* 33 (2002) 2: 167 - 188
- Momsen, Janet Henshall. 2004. *Gender and Development*. London, UK and New York, USA: Routledge.
- Monsalvo-Velázquez, Gabriela and Philippus Wester. 2002. Equidad de género e intragénero en el manejo del agua de riego? Cargos de autoridad en tres niveles de representación en la cuenca Lerma-Chapala, México. In: Brigitte Boehm Schoendube, Juan Manuel Durán Juárez, Martín Sánchez Rodríguez and Alicia Torres Rodríguez (eds.), *Los estudios del Agua en la cuenca Lerma-Chapala-Santiago*. Zamora, Michoacán, México: El Colegio de Michoacán, Universidad de Guadalajara.
- Moore, H. 1994. *A passion for difference*. Cambridge, U.K.: Policy Press
- Moore, Mick. 1989. The fruits and fallacies of neoliberalism: The case of irrigation policy. *World Development* 17 (1989) 11, pp. 1733-1750.
- Moore, Mick. 1991. Rent-seeking and Market Surrogates: The Case of Irrigation Policy. In: C. Colclough and J. Manor (eds.), *States or Markets? Neo-liberalism and the Development Policy Debate*. IDS Development Studies Series. Oxford, U.K.: Clarendon Press.
- Morgan, Robin (ed.). 1984. *Sisterhood is Global. The International Women's Movement Anthology*. U.K.: Penguin Books.

- Moris, J. 1987. Irrigation as a privileged solution in African development. *Development Policy Review* 5 (1987), pp. 99-123
- Moris, J.R. and D.J. Thom. 1990. *Irrigation development in Africa. Lessons of experience.* Studies in water policy and management no. 14. London, U.K.: Westview Press
- Mosse, David. 1997. The Symbolic Making of a Common Property Resource: History, Ecology and Locality in a Tank-irrigated landscape in South India. *Development and Change* 28 (1997): 467-504
- Mosse, David. 1999. Colonial and contemporary ideologies of community management: the case of tank irrigation development in South India. *Modern Asian Studies* 33 (1999) 2: 303-338
- Moench, Marcus, Ajaya Dixit, S. Janakaran, M.S. Rathore and Srinivas Mudrakartha. 2003. *The Fluid Mosaic. Water Governance in the Context of Variability, Uncertainty and Change.* A synthesis paper. Kathmandu, Nepal: Nepal Water Conservation Foundation and Boulder, Colorado, USA: Institute for Social and Environmental Transition.
- Musch, A. 2001. *The small gods of participation.* PhD Thesis. Enschede, The Netherlands: University of Twente.
- Mziray, Nuru Ressa. 2004. *Gender Participation in Traditional Irrigation Schemes: A Case Study of Mkindo, Tanzania.* Msc thesis, International Land and Water Management. Wageningen: Wageningen University.
- Narain, Vishal. 2003. *Institutions, Technology and Water Control. Water Users Associations and Irrigation Management Reform in Two Large-Scale Systems in India.* New Delhi, India: Orient Longman.
- Nicholson, Linda. 1995. Introduction. In: Sheila Benhabib, Judith Butler, Drucilla Cornell and Nancy Fraser. *Feminist Contentions. A Philosophical Exchange.* New York, USA and London, UK: Routledge.
- Nicholson, Linda. 1998. Gender. In: Alison M. Jaggar and Iris Marion Young (eds.), *A Companion to Feminist Philosophy.* Blackwell Companions to Philosophy. Massachusetts, USA and Oxford, UK: Blackwell Publishers, pp. 289-297
- NBTDP. 1998. *Partnership in practice. Women as Effective Partners in NBTDP.* Jalpalguri, India: NBTDP.
- Ng, Cecilia and Maznah Mohamed. 1990. Primary but Subordinated: Changing Class and Gender Relations in Rural Malaysia. In: Bina Agarwal (ed.) 1990. *Structures of Patriarchy. The State, the Community and the Household.* London, UK and New Jersey, USA: Zed Books, pp. 52 -82
- Nguyen Manh Ta, and Luong Thuan Ha. 1994. Irrigation management transfer in Vietnam. Paper presented at the International Conference on Irrigation Management Transfer, 20-24 September, Wuhan, China.
- Oakley, Ann. 1972. *Sex, gender and society.* London, UK: Maurice Temple Smith.
- O'Laughlin, Bridget. 1995. Myth of the African Family in the World of Development. In: Deborah Fahy Bryceson (ed.), *Women wielding the hoe. Lessons from Rural Africa for Feminist Theory and Development Practice.* Oxford, U.K. and Washington, D.C., U.S.A.: Berg Publishers, pp.63-92

- O' Laughlin, Bridget. 1999. *In defence of the household: Marx, gender and the utilitarian impasse*. ISS Working Paper 289. The Hague, The Netherlands: ISS.
- Oldenziel, Ruth. 1999. *Making Technology Masculine. Men, Women and Modern Machines in America 1870 - 1945*. Amsterdam; Amsterdam University Press.
- Oorthuizen, J. 2003. *Water, works and wages. The Everyday Politics of Irrigation Management Reform in the Philippines*. Wageningen University Water Resources Series. New Delhi, India: Orient Longman.
- Oooijevaar, Marjolein and Maartje van Reedt Dortland. 2003. Making the means lead to an end. Exploring the sustainability of farmers' water use innovations in Lurichocha, Ayacucho, Peru. MSc thesis. Wageningen, The Netherlands: IWE, Wageningen University.
- Open University. 2005. Summary of Course 'Engineering in Action'.
- Ostrom, Elinor. 1990. *Governing the common. The evolution of institutions for collective action*. Cambridge, UK: Cambridge University Press.
- Ostrom, Elinor. 1992. *Crafting Institutions for self-governing irrigation systems*. San Francisco, USA: Institute for Contemporary Studies Press.
- Ostrom, Elinor. 2002. How farmer managed irrigation systems build social capital to outperform agency managed systems that rely primarily on physical capital. In: Prachanda Pradhan and Upendra Gautam (eds.), *Farmer managed irrigation systems in the changed context*. Proceedings of the Second International Seminar held on 18-19 April, 2002, Kathmandu, Nepal.
- Pacari, Nina. 1998. La mujer indígena, medio ambiente y biodiversidad. In: Ramón Torres Galarza (ed.), *Derechos de los pueblos indígenas: situación jurídica y políticas del Estado*. Quito, Ecuador: CONAIE/Ceplaes/ Abya-Yala, pp. 59-68
- Palmer, I. 1991. *Gender and population in the adjustment of African economies: Planning for change*. Geneva, Switzerland: International Labor Organization.
- PATA. 1996. *Participatory Irrigation Scheme Development Process Guide Book*. Pakistan: PATA.
- Pearson, Ruth and Cecile Jackson. 1998. Introduction: Interrogating development: feminism, gender and policy. In: Ruth Pearson and Cecile Jackson (eds.), *Feminist visions of development. Gender analysis and Policy*. London and New York: Routledge, pp. 1-16
- Perry, Christopher J. 1996. Quantification and measurement of a minimum set of indicators of the performance of irrigation systems. Mimeo. Colombo, Sri Lanka: IWMI.
- Perry, Chris J., David Seckler and M. Rock. 1997. *Water as an economic good: A solution or a problem?* IIMI Research Report No. 14. Colombo, Sri Lanka: IIMI.
- Phoca, Sophia. 2001. Feminism and Gender. In: Sarah Gamble (ed.), *The Routledge Companion to Feminism and Postfeminism*. London, UK and New York, USA: New York, pp. 55-65
- Platteau, Jean-Philippe. 1996. The Evolutionary Theory of Land Rights as Applied to Sub-Saharan Africa: A Critical Assessment. *Development and Change* 27 (1996), pp. 29-86

- Plusquellec, H., C. Burt and H.W. Wolter. 1994. *Modern water control in irrigation*. World Bank Technical Paper 246. Washington D.C., USA: The World Bank.
- Plusquellec, H. 2002. *How design, management and policy affect the performance of irrigation projects. Emerging modernization procedures and design standards*. Bangkok, Thailand: FAO.
- PMI-BF/IIMI. 1993. Bilan et synthèse des travaux 1991-93. Ouagadougou, Burkina Faso: IIMI.
- Pol, Ineke van de. 1992. Claro, hay que pelear el agua: roles de género en las actividades de riego. Lima, Peru: Stichting Nederlandse Vrijwilligers (SNV), mimeo.
- Poudel, Rabi. 2000. *Farmers' laws and irrigation: Water rights and dispute management in the hills of Nepal*. PhD Thesis. Wageningen, The Netherlands: Wageningen University.
- Povel, S.A.M.T. 1990. Participatory development of a women's irrigation scheme. Case: The Nyandusi horticultural scheme, Nyanza Province, Kenya. In: DISC (eds.), *Introductions and contributions to the international workshop 'Design for sustainable farmer-managed irrigation schemes in sub-Saharan Africa*. Volumes 1 & 2. Department of Irrigation and Soil and Water Conservation (DISC). Wageningen, The Netherlands: Wageningen Agricultural University, pp. 4C
- Pradhan, Naresh C. 1989. Gender Participation in irrigation system activities in the hills of Nepal. *Proceedings of the Second Annual Workshop on Women in Farming Systems, September 1989*. Rampur and Kathmandu, Nepal: Institute of Agriculture and Animal Science and USAID.
- Pradhan, Prachanda. 1983. Chhattis Mauja. In *Water Management in Nepal: Proceedings of a Seminar on Water Management Issues*. Kathmandu, Nepal: Agricultural Projects Service Centre.
- Pradhan, Prachanda. 1989. *Patterns of Irrigation Organization in Nepal. A Comparative Study of 21 Farmer-Managed Irrigation Systems*. Colombo, Sri Lanka: IIMI.
- Prins, U. 1996. Losing water and water getting lost. MSc Thesis. Wageningen, The Netherlands: Wageningen Agricultural University.
- PSF (Project Sensibilisation et Formation des paysans autour des barrages). 1993. *Attribution des parcelles aux femmes dans les périmètres en aval des barrages: possibilités et limites*. Ouagadougou, Burkina Faso: PSF, Ministère de l'Agriculture et des Ressources Animales.
- Pun, Shuku. 2000. Gender, Land and Irrigation Management in Rajapur. In: Rajendra Pradhan, Franz von Benda-Beckmann and Keebet von Benda-Beckmann (eds.). *Water, Land and Law. Changing Rights to Land and Water in Nepal*. Kathmandu, Nepal/Wageningen /Rotterdam, The Netherlands: FREEDEAL/WAU/EUR: 195 - 216
- Quisumbing, Agnes R. 1996. Male-female differences in agricultural productivity. Methodological Issues and Empirical Evidence. *World Development* 24 (1996) 10: 1579-1595

- Radcliffe, Sarah. 1986. Gender relations, peasant livelihood strategies and migration: a case study from Cuzco. *Bulletin of Latin American Research* 5 (1986) 29 - 47
- Radcliffe, Sarah A. 2000. Indigenous women, rights and the nation state in the Andes. Draft. Cambridge, UK: University of Cambridge.
- Rajapakse, Darshini Anna. 1989. Agricultural transformation and changing labor relations: Implications for peasant women in Sri Lanka. In: *The Hidden Face of Development: Women, Work and Equality in Sri Lanka*. Colombo, Sri Lanka: Centre for Women's Research (CENWOR), pp. 41-62
- Rajapakse, Darshini Anna. 1992. Laws and chaos: Impact of large scale irrigation systems on inter- and intra-household tenurial and labor relations. Paper presented at the Symposium on Irrigation and Society "The Mahaweli Project, Sri Lanka", 23-27 August, Monte Verita, Switzerland.
- Rao, S.C., T. Hassan and C.V. Shyamala. 1991. Role of Women in Water Management. Experiences in Sreeramsagar Project, Andhra Pradesh. Paper presented at a seminar on Men and Women Water Users in Water Management. Hyderabad, India: PMU, Indo-Dutch Training Production Management Unit.
- Rap, Edwin, Philippus Wester and Luz Nereida Pérez-Prado. 2004. The Politics of Creating Commitment: Irrigation Reforms and the Reconstitution of the Hydraulic Bureaucracy in Mexico. In: Mollinga and Bolding (eds.), *The Politics of Irrigation Reform. Contested Policy Formulation and Implementation in Asia, Africa and Latin America*. Global environmental governance series. Aldershot, UK and Burlington, USA: Ashgate.
- Ravesteijn, Wim. 1997. *De Zegenrijke Heeren der Wateren. Irrigatie en Staat op Java*. PhD. Thesis, Delft: Delft University Press
- Razavi, Shara. 1998. Becoming multilingual: the challenges of feminist policy advocacy. In: Miller, Carol and Shahra Razavi (eds.), *Missionaries and Mandarins. Feminist engagement with development institutions*. London, U.K.: Intermediate Technology Publications, pp. 20-41
- Rens, M. 1992. *La mitad del mundo. Arbeidsdeling, genusidentiteit and genussymboliek in de Ecuatoriaanse Andes*. Thesis. Amsterdam, The Netherlands: Anthropologisch Sociologisch Centrum, University of Amsterdam.
- Richards, Patricia. 2005. The Politics of Gender, Human Rights, and Being Indigenous in Chile. *Gender and Society* 19 (2), pp. 199-220
- Rogers, Barbara. 1980. *The Domestication of Women: Discrimination in developing societies*. London, U.K.: Tavistock.
- Rocheleau, Dianne and D. Edmunds. 1997. Women, Men and Trees. Gender, Power and Property in Forest and Agrarian Landscapes. *World Development* 25 (1997) 8, pp. 1351-1371
- Rorty, Richard. 1986. Solidarity or Objectivity? In: John Rajchman and Cornel West (eds.), *Post-analytic philosophy*. New York, USA: Columbia University Press, pp. 3 - 19 (In Dutch: 1990. Solidariteit of objectiviteit? In: Richard Rorty. *Solidariteit of objectiviteit. Drie filosofische essays*. Meppel/Amsterdam, The Netherlands: Boom, pp. 19 - 40

- Rosaldo, Michelle Z. 1974. *Woman, Culture and Society: A theoretical Overview*. In: M. Rosaldo and L. Lamphere (eds.), *Woman, Culture and Society*. Stanford, US: Stanford University Press, pp. 17-42
- Rösing, I. 1997. *Los diez géneros de Amarete, Bolivia*. In: D.Y. Arnold (ed.), *Mas allá del silencio. Las fronteras de género en los Andes*. La Paz, Bolivia: CIASE/ILCA, pp. 77-93
- Roth, Dik. 2003. *Ambition, Regulation and Reality. Complex use of land and water resources in Luwu, South Sulawesi, Indonesia*. PhD Thesis, Wageningen, The Netherlands: Wageningen University.
- Roth, Dik, Rutgerd Boelens and Margreet Zwarteveen. 2005. *Liquid Relations. Contested Water Rights and Legal Complexity*. New Brunswick, New Jersey, USA and London, UK: Rutgers University Press.
- Rubin, Gayle. 1975. *The Traffic in Women*. In: R. Reiter, *Toward an Anthropology of Women*. New York, U.S.A.: Monthly Review Press.
- Rushdie, Salman. 1999. *The Ground Beneath her Feet*. New York, USA: Henry Holt Company, Inc.
- Sagardoy, Juan A. 1995. *Lessons learned from irrigation management transfer programmes*. In: Sam H. Johnson, Douglas L. Vermillion and Juan A. Sagardoy (eds.), *Irrigation Management Transfer. Selected Papers from the International Conference on Irrigation Management Transfer. Wuhan, China 20-24 September, 1994*. Colombo, Sri Lanka: IIMI and Rome, Italy: FAO, pp. 39-46
- Sally, Hilmy. 1993. *Review of IIMI-Burkina Faso Program 1993*. Mimeo. Colombo, Sri Lanka: IIMI.
- Sally, Hilmy and Charles Abernethy. 1993. *Irrigation systems performance and local management of irrigation schemes: some preliminary lessons from Burkina Faso*. Paper presented for the International Program Review of IIMI, December 1993. Colombo, Sri Lanka: IIMI.
- Sally, Hilmy and Charles Abernethy. 1994. *Irrigation system performance in West Africa*. Paper presented at the FAO Regional Consultation on Irrigation Extension, 5-9 December 1994, Accra, Ghana.
- Sarin, Madhu. 1995. *Regenerating India's Forests: Reconciling Gender Equity with Joint Forest Management*. *IDS Bulletin* 26 (1995) 1, pp. 83-91
- Sayer, Andrew. 1992. *Method in Social Science. A realist approach*. London, UK and New York, USA: Routledge.
- Schaaf, Charlotte van der. 2000. *Land, Water and Gender in Rupakot Village, Nepal*. In: Rajendra Pradhan, Franz von Benda-Beckmann and Keebet von Benda-Beckmann (eds.), *Water, Land and Law. Changing Rights to Land and Water in Nepal*. Kathmandu, Nepal/Wageningen /Rotterdam, The Netherlands: FREEDEAL/WAU/EUR: pp.169-194
- Schenk-Sandbergen, Loes and Outhaki Choulamany-Kamphoui. 1995. *Women in rice fields and offices: irrigation in Laos. Gender specific case-studies in four villages*. Heiloo, The Netherlands: Empowerment.

- Scheer, Steven. 1996. *Communication between irrigation engineers and farmers. The case of project design in North Senegal*. PhD Thesis. Wageningen: Wageningen Agricultural University.
- Schreiner, Barbara. 2001. Water, gender and poverty. Keynote address at the International Conference on Freshwater, Bonn, Germany.
- Schrijvers, Joke. 1984. Blueprint for undernutrition. An example from Sri Lanka. *Sociologia Ruralis* Vol. XXIV (1984) 3-4, pp. 256-273. (Reprinted in: Schrijvers, J., 1986. Blueprint for undernutrition. In: Schrijvers, J., *Mothers for Life: Motherhood and marginalization in the North Central Province in Sri Lanka*. Delft, The Netherlands: Eburon, pp. 57-78 and in a slightly different version in: Agarwal, Bina (ed.). 1988. *Structures of Patriarchy. The State, the Community and the Household*. London, U.K. and New Jersey, U.S.A.: Zed Books Ltd., pp. 29-51)
- Schrijvers, Joke. 1992. Questions of gender in development planning: Women's experiences in a new settlement of the Mahaweli Project. Paper presented at the Symposium on Irrigation and Society "The Mahaweli Project, Sri Lanka", 23-27 August, Monte Verita, Switzerland.
- Scott, Joan. 1986. Gender: A Useful Category of Historical Analysis. *American Historical Review* 91 (1986) 5: 1053-1075
- Scott, James. 1985. *Weapons of the Weak. Everyday Forms of Peasant Resistance*. Yale, USA: Yale University Press.
- Sen, Gita and Caren Grown. 1985. *Development, Crises and Alternative Visions: Third World Women's Perspectives*. Bangalore, India: DAWN Secretariat. (Subsequently published by Monthly Review Press, New York.)
- Sen, Amartya K. 1990. Gender and Cooperative Conflicts. In: Irene Tinker (ed.), *Persistent Inequalities*. Oxford, UK: Oxford University Press.
- Shah, Esha. 2003. *Social Designs. Tank Irrigation Technology and Agrarian Transformation in Karnataka, South India*. Wageningen University Water Resources Series. New Delhi, India: Orient Longman.
- Shah, Tushaar, Barbara van Koppen, Douglas Merrey, Marna de Lange and Madar Samad. 2002. *Institutional Alternatives in African Smallholder Irrigation: Lessons from International Experience with Irrigation Management Transfer*. IWMI Research Report No. 60. Colombo, Sri Lanka: IWMI.
- Shankari, Uma and Esha Shah. 1993. *Water Management Traditions in India*. Chennai, India: PPST Foundation.
- Sheridan, Michael, J. 2002. An irrigation Intake Is Like a Uterus: Culture and Agriculture in Precolonial North Pare, Tanzania. In: *American Anthropologist* 104 (1):79-92.
- Shiva, Vandana. 1989. *Staying Alive: Women, Ecology and Development*. London, UK: New Left Books.
- Small, Leslie E. and Ian Carruthers. 1991. *Farmer-financed irrigation: The economics of reform*. Cambridge, U.K.: Cambridge University Press.
- Small, Leslie E. and Mark Svendsen. 1990. A framework for assessing irrigation performance. *Irrigation and Drainage Systems* 4 (1990): 115-138

- Small, Leslie E. and mark Svendsen. 1992. *A framework for assessing irrigation performance*. Working papers on irrigation performance no. 1. Washington D.C.: USA: IFPRI.
- Shresta, Ratna Sansar and Nirmal Kumar Sharma. 1987. A comparative study of farmer-managed and agency-managed irrigation systems. In: *Irrigation Management in Nepal: Research Papers from a national seminar*. Bharatpur, Nepal, 4-6 June, 1987. Kathmandu, Nepal: IIMI.
- Spaink, Karin. 1998. M/V. Doorhalen wat niet van toepassing is. Amsterdam, The Netherlands: Nijgh and Van Ditmar.
- Spivak, Gayatri Chakravorty. 1988. Can the Subaltern Speak? In: Cary Nelson and Larry Grosberg (eds.), *Marxism and the Interpretation of Culture*. Urbana, USA: University of Illinois Press, pp. 271 -313 (First appeared in 1985 as "Can the Subaltern Speak? Speculations on Widow Sacrifice", *Wedge* (7/8) Winter/Spring 1985, pp.120-130
- Starn, Orin. 1991. Missing the Revolution. *Anthropologists and the War in Perú. Cultural Anthropology* 6 (1991) : 13-38
- Stolen, K. 1987. Participación laboral y división sexual de trabajo. *A media voz*. Quito, Ecuador: CEPLAES.
- Strang, Veronica. 2005. Taking the Waters. In: Anne Coles and Tina Wallace (eds.) *Gender, Water and Development*. Oxford, UK and New York, USA: Berg Publishers, pp. 21-38
- Svendsen, Mark and Leslie E. Small. 1990. Farmers' perspective on irrigation performance. *Irrigation and Drainage Systems* 4 (1990): 385-402
- Swyngedouw Erik. 1997. Neither global nor local: 'glocalization' and the politics of scale, in: K. R. Cox (ed.), *Spaces of Globalization: Reasserting the Power of the Local*. New York, USA: Guilford Press, pp 137-166
- Tang, Shui Tan. 1992. *Institutions and Collective Action: Self-governance in Irrigation*. San Francisco, USA: ICS Press.
- Tinker, Irene. 1976. The Adverse Impact of Development on Women. In: Irene Tinker and M. Bramsen (eds.), *Women and World Development*. Washington, D.C., U.S.A.: Overseas Development Council.
- Tinker, Irene (ed.). 1990. *Persistent Inequalities. Women and World Development*. New York, USA and Oxford, UK: Oxford University Press.
- Tinker, Irene. 1990. The making of a field: Advocates, Practitioners and Scholars. In: Irene Tinker (ed.), *Persistent Inequalities. Women and World Development*. New York, USA and Oxford, UK: Oxford University Press, pp. 27-53
- Tuitelaars de Quitón, C., M.E. Pozo, R.M. Antezana Iriarte and R. Saavedra Crespo. 1994. *Mujer y riego en Punata, aspectos de género. Situación de uso, acceso y control sobre el agua para riego en Punata*. Cochabamba, Bolivia: PEIRAV.
- Ubels, J. and L. Horst (eds.). 1993. *Irrigation design in Africa. Towards an interactive method*. Wageningen, The Netherlands: Wageningen Agricultural University and Technical Centre for Rural and Agricultural Cooperation (CTA).

- Underhill, H.W. 1990. *Small scale irrigation in Africa in the context of rural development*. Bedford, U.K.: Cranfield Press. (Also published in 1984 as an FAO paper.)
- Uphoff, N. 1986. *Improving international irrigation management with farmer participation. Getting the process right*. Studies in Water Policy and Management No. 11. Boulder, Colorado, U.S.A.: Westview Press.
- Uphoff, Norman (with Priti Ramamurthy and Roy Steiner). 1991. *Managing irrigation. Analyzing and improving the performance of bureaucracies*. New Delhi, India: Sage.
- Uphoff, N. 2002. Understanding and utilizing the softer aspects of 'software' for improving irrigation management. In: P. Pradhan and U. Gautam (eds.), *Farmer Managed Irrigation Systems in the Changed Context*. Proceedings of the Second International Seminar held on 18-19 April, 2002, Kathmandu, Nepal. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust, pp. 33-59
- Upperman, Els. 2000. Gender relations in a traditional irrigation scheme in Northern Tanzania. In: Colin Creighton and C.K. Omari (eds.), *Gender, family and work in Tanzania*. Aldershot, U.K.: Ashgate, pp. 357-379
- Vattuone, M.E. , E. Yap and H. Segura. 1996. *Mirando el riego con enfoque de género*. Lima, Peru: SNV Perú.
- Vera, Juana. 2004. "Cuanto más doy, más soy ..." Discursos, normas y género: la institucionalidad de las organizaciones de riego tradicionales en los Andes del sur peruano. In: Peña, F.(ed.) *Los pueblos indígenas y el agua: desafíos del siglo XXI*. El Colegio de San Luis, WALIR, IMTA. Obranegra Editores: Mexico D.F. and Bogotá, Colombia.
- Vera Delgado, Juana R. 2004. Irrigation Management, the Participatory Approach and Equity in an Andean Community. In: Vivienne Bennett, Sonia Dávila-Poblete and Maria Nieves (eds.), *Opposing Currents. The Politics of Water and Gender in Latin America*. Pittsburgh, USA: Pittsburgh University Press, pp. 109 - 122
- Vera Delgado, Juana R.. 2005a. *Género, etnicidad y derechos de agua en las legislaciones hídricas y normatividades locales. Un estudio comparativo de Perú, Bolivia y Ecuador*. Universidad de Wageningen, WALIR : Países Bajos, Wageningen.
- Vera Delgado, Juana R. 2005b. Una Fotografía del sistema de riego de Coporaque y los discursos de seguridad hídrica (Etapa exploratoria de la investigación de campo). Field report November 2005. Wageningen, The Netherlands : Wageningen University.
- Vercruyssen, B. 1991. *Gender en grondrechten in irrigatie ontwikkeling*. MSc Thesis. Wageningen, The Netherlands: Wageningen Agricultural University.
- Vermillion, Douglas L. 1991. *The turnover and self-management of irrigation institutions in developing countries. A discussion paper for the new program of IIMI*. Discussion Paper. Colombo, Sri Lanka: IIMI.
- Vijfhuizen, Carin. 1998. *The people you live with. Gender identities and social practices, beliefs and power in the livelihoods of Ndau women and men in a village with an*

- irrigation scheme in Zimbabwe*. PhD Thesis. Wageningen, The Netherlands: Wageningen Agricultural University.
- Villareal, Magdalena. 1994. *Wielding and Yielding. Power, Subordination and Gender Identity in the Context of a Mexican Development Project*. PhD Thesis. Wageningen, The Netherlands: Agricultural University Wageningen.
- Vincent, Linden. 1997a. *Irrigation as a technology, irrigation as a resource: a sociotechnical approach to irrigation*. Inaugural speech. Wageningen, The Netherlands: Wageningen Agricultural University.
- Vincent, Linden. 1997b. *Agro-ecology, participation and irrigation: Learning from different system concepts*. Paper presented at the workshop "More from less: better water management". Cranfield, U.K.: Cranfield University.
- Vincent, Linden. 2004. Personal communication.
- Vintges, Karen. 2003. *De terugkeer van het engagement*. Boom essay. Amsterdam, The Netherlands: Boom.
- Vokral, Edita. 1991. *La introducción de riego y cambios sociales en la sierra ecuatoriana: Punín*. Ecuador. Paper for the International Congress of Americanists, July 1991. New Orleans, USA.
- Wade, Robert. 1979. *The social response to irrigation: an Indian case study*. *Journal of Development Studies* 16 (1979) 1: 3-26
- Wade, Robert. 1987. *Village Republics: Economic Conditions for Collective Action in South India*. Cambridge, UK: Cambridge University Press.
- Wajcman, J. 1991. *Feminism confronts technology*. Pennsylvania, U.S.A.: Pennsylvania State University Press.
- WALIR. 2002. *Indigenous Water Rights, Local Water Management, and National Legislation*. WALIR Studies Volume 2, CEPAL-United Nations / Santiago de Chile & Wageningen University / Wageningen.
- Wambui Njagi, Jane. 2004. *Gender and Poverty: An analysis of Discourses in Mwea Irrigation Scheme*. MA thesis Development Studies. The Hague, The Netherlands: Institute of Social Studies.
- Webb, Patrick. 1989. *Intrahousehold decisionmaking and resource control: The effects of rice commercialization in West Africa*. Working Papers on commercialization of agriculture and nutrition no. 3. Washington D.C., USA: IFPRI.
- Weber, Max. 1964. *The Theory of Social and Economic Organizations*. New York: Free Press of Glencoe.
- Wegerich, Kai. 2005. *Institutional Change in Water Management at Local and Provincial Level in Uzbekistan*. European University Studies, Series IV:26. Bern, Switzerland (etc.): Peter Lang.
- Weismantel, M.J. 1989. *Making breakfast and raising babies. The Zumbagua household as a constituted process*. In: R.R. Wilk (ed.), *The household economy: Reconsidering the domestic mode of production*. Boulder, Colorado, USA: Westview Press, pp. 55-72

- Wester, Philippus, Arjen During and Joost Oorthuizen. 1995. *Locally managed irrigation in the Senegal River valley in the aftermath of state disengagement*. Short Report Series on Locally Managed Irrigation, no. 9. Colombo, Sri Lanka: IIMI.
- Wester, Philippus and Jeroen Warner. 2002. River Basin Management Reconsidered. In: A.R. Turton and R. Henwood (eds.), *Hydro-politics in the developing world. A Southern African perspective*. Pretoria, South Africa; AWIRU.
- Wester, Philippus, Hugo de Vos and Jim Woodhill. 2004. The Enabling Environment. Discussion Paper Theme 3. FAO/Netherlands Conference on Water for Food and Ecosystems. http://www.fao.org/ag/wfe2005/docs/Theme_III.doc
- Westerman, Frank. 2002. *Ingenieurs van de ziel*. Amsterdam, The Netherlands: Atlas.
- White, Sarah C. 1992. *Arguing with the Crocodile. Gender and Class in Bangladesh*. London, UK: Zed Books, 171 p.
- Whitehead, Ann. 1981. I'm hungry mum: the politics of domestic budgeting. In: K. Young, R. McCullagh and C. Wolkowitz (eds.), *Of Marriage and the Market*. London: UK: CSE Books.
- Whitehead, A. 1991. Rural Women and Food Production in Sub-Saharan Africa. In: J. Dreze and A. Sen (eds.), *Political Economics of Hunger*. Oxford, U.K.: Clarendon Press, pp. 425-473
- Wittfogel, Karl A. 1957. *Oriental Despotism: A comparative Study of Total Power*. New Haven, Connecticut: Yale University Press.
- World Bank. 1995. Rural Women in the Sahel and their Access to Agricultural Extension. Sector Study. Overview of Five Country Studies. World Bank Report No. 13532, Africa Region, Western Africa Department, Agriculture and Environment Division. Washington D.C., U.S.A.: World Bank.
- World Water Council. 2000. *Mainstreaming Gender in Water Resources Management. Why and How*. Background papers for the World Vision Process. Paris, France: World Water Vision Unit, c/o UNESCO.
- Worster, D. 1985. *Rivers of Empire. Water, aridity and the growth of the American West*. New York, USA: Pantheon Books.
- Wright, M. 1983. Technology, Marriage and Women's Work in the History of Maize-Growers in Mazabuka, Zambia: A Reconnaissance. *Journal of Southern African Studies* 10 (1983): 71-85
- Yoder, Robert. 1994. *Organization and management by farmers in the Chhattis Mauja Irrigation System, Nepal*. Colombo, Sri Lanka: IIMI.
- Yoder, Robert. 1994b. *Locally Managed Irrigation Systems. Essential Tasks and Implications for Assistance, Management Transfer and Turnover*. Colombo, Sri Lanka: IIMI.
- Zaag, Pieter van der. 1992. *Chicanery at the canal. Changing practice in irrigation management in Western Mexico*. Amsterdam, The Netherlands: CEDLA
- Zigterman, Erik. 1996. The difficult development process of a participatory irrigation scheme development process: the PATA Project Case. *WRI, PATA, IIMI*.

- Proceedings and conclusions of the Seminar on Sustainable Development of Irrigation.* Islamabad, Pakistan.
- Zoungrana, C. 1995. *Les relations "genre" et la performance des périmètres irrigués au Burkina Faso: Cas de Dakiri - Province de la GnaGna.* Research report. Ouagadougou, Burkina Faso: Projet Management de l'Irrigation au Burkina Faso (PMI-BF) and Colombo, Sri Lanka: IIMI.
- Zwarteveen, Margreet. 1993b. Report on a short trip to Burkina Faso. Mimeo. Colombo, Sri Lanka: IIMI.
- Zwarteveen, Margreet. 1994a. *Gender Issues, Water Issues. A Gender Perspective to Irrigation Management, Working Paper No. 32.* Colombo, Sri Lanka: International Irrigation Management Institute (IIMI).
- Zwarteveen, M. Z. 1995. *Gender Aspects of Irrigation Management Transfer: Rethinking Efficiency and Equity*, in: Johnson, S.H. et al. (eds.), *Selected papers from the International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September, 1994*, International Irrigation Management Institute (IIMI). Rome, Italy: FAO
- Zwarteveen, Margreet and Marina Endevelde. 1995. Rural Women's Questions are Agrarian Questions. A discussion of the intellectual and political construction of realities of rural women. In: Agrarian Questions' Organizing Committee (eds.), *Agrarian Questions. The Politics of Farming anno 1995.* Wageningen, The Netherlands, pp. 1886-1896
- Zwarteveen, M.Z. 1995. *Linking Women to the Main Canal. Gender and Irrigation Management.* Gatekeeper Series No. 54. London, U.K.: International Institute for Environment and Development (IIED)
- Zwarteveen, Margreet and Nita Neupane. 1995. Gender Aspects of Irrigation Management: the Chhattis Mauja Irrigation System in Nepal. *Asia-Pacific Journal of Rural Development* V (1995) 1, pp. 1-25
- Zwarteveen, M. and N. Neupane. 1996. *Free-riders or victims: Women's nonparticipation in Irrigation Management in Nepal's Chhattis Mauja Irrigation Scheme.* Research Report No. 7. Colombo, Sri Lanka: IIMI.
- Zwarteveen, M.Z. 1996. *A Plot of One's Own: Gender Relations and irrigated land allocation policies in Burkina Faso.* IIMI Research Report 10. Colombo, Sri Lanka: International Irrigation Management Institute. (Also published as an ICID paper in 1995, and as a CGIAR gender series paper, 1995).
- Zwarteveen, Margreet. 1997. Water: from basic need to commodity. A discussion on gender and water rights in the context of irrigation. *World Development* 25 (1997) 8: 1335-1349
- Zwarteveen, Margreet Z. 1998. *Identifying gender aspects of new irrigation management policies.* In: *Agriculture and Human Values* 15 (1998), pp. 301-312
- Zwarteveen, Margreet and Ruth Meinzen-Dick. 2001. Gender and property rights in the commons: Examples of water rights in South Asia. *Agriculture and Human Values* 18 (2001): 11-25

Annex

Methodology of Burkina Faso and Nepal case studies

Burkina Faso

After a first introductory visit, a sample of households was selected from the list of plottolders to represent households in which only men have plots, and those in which also women have plots. In the entire sample there were seven households in which both men and women had plots, 10 in which only the man had a plot, 2 in which only the woman had a plot, and 5 widows. These plottolders were visited and interviewed during four visits to the area, of each ten days, with the help of a structured interview guide. In addition to the plottolders, interviews were also held with the 'chef de terre' and with the officebearers of the cooperative, as well as with the agricultural extension officer.

Next to the information collected through the gender study, data collected through other IIMI studies were also used, in particular the information about the quantity produced in each plot.

Nepal

Data for this study were collected through participant observation and repeated in-depth interviews with members of a small number of households in two head-end villages in the Chhattis Mauja irrigation system: nine households in Shankar Nagar Tola (SNT) and eight households in Naya Chaparrhati (NC). These are villages with a relatively large number of female headed farms. These households were purposively selected to include some of each identified category, as follows:

	SNT	NC
Rich	1	2
Middle	6	4
Poor	2	2

In addition, at least two female headed households in each village were included in the sample. In SNT, one female headed household belonged to the rich category and one to the middle category; in NC one belonged to the middle category and one to the poor group. These households were all visited at least once a week over a period of 6 months, either in the house or in the fields. All the quotes in the chapter are derived from this part of the study. In addition, two group discussions were organized with female farmers of the two villages to identify and explore their

irrigation related problems. A few long qualitative interviews were also held with female and male farmers in surrounding villages and with irrigation leaders.

To cross-check and validate the information obtained, a survey was held towards the end of the study in three different villages. These villages were selected to represent the head, middle, and tails sections of the Chhattis Mauja scheme. The total number of respondents for these three villages included in this 'single-shot' survey was 128. The information presented in the chapter, however, focuses primarily on the head-end village, and the data given refer to Purbi Shankar Nagar only.

Summary

In this thesis I describe my search for ways of thinking about, and conceptualizing, irrigation realities that allow recognition of gender as constitutive of such realities. This effort logically follows from the realization that in mainstream conceptualizations of irrigation it is difficult to accurately conceive of women or to make sense of gender relations. I believe that the resulting invisibility and misrecognition of women and gender is one important cause for the resilience of irrigation professionalism to allow women a legitimate existence in the irrigation world, and to deal with gender as an important cause of inequities and inefficiencies.

Irrigation truly is a men's world. Rights to water and irrigated land are mostly vested in men, and decisionmaking about irrigation is likewise dominated by men. Ways of speaking and thinking about irrigation can also be characterized as masculine in that they render the work and activities of women invisible, and denote the analysis of social and gender relations as irrelevant. The irrigation profession is also masculine: most irrigation professionals are men, and professionalism is associated with masculinity.

The 'maleness' or masculinity of irrigation is not the natural order of things, nor (necessarily) the most desirable or efficient way of organizing the irrigation world. Instead, irrigation has been discursively, culturally and ideologically *constructed* as a male domain, technology and profession. Through this construction, irrigation is provided with a special status. Professional irrigation discourses, understood as particular truths and representations shaped by specific conjunctions of knowledge and power, lend support to this construction by identifying appropriate and legitimate ways of practicing irrigation as well as of speaking and thinking about it. Showing that this is so, and in doing so challenging the conventional ways in which irrigation is conceived and defined, is an important part of what this thesis is about. It is based on the recognition that language and meanings constitute one important field of (feminist) politics and power. The pre-occupation of the book, therefore, is with how different conceptual schemes and theoretical languages, seen as specific ways of looking at and ordering irrigation realities reflecting specific concerns, priorities and interests, visualize women and allow questioning gender relations.

My conceptualization of gender (chapter 1) frames the direction of my quest. I use a social-constructivist notion of gender that says that what gender 'is' always depends on the social relations and context in which meaning is attributed to gender identities and relations. This means that gender is a contextual phenomenon that does not have a fixed essence. Gender is an open site of contestation, and its meaning is subject to debate and re-interpretations. This understanding of gender has implications for visualizing women in irrigation. First: it is impossible to know beforehand who or what the candidates for visualization are. And second: the

language and the terms that are used to visualize and represent are a constitutive element of what is represented.

A further theoretical framing of my quest is provided by ideas developed by the Social Construction of Technology School, by actor network theory, and by feminist philosophers like Haraway. It questions the taken-for-granted boundaries between 'nature' (and biology) and 'culture', or between 'technology' and 'society' and claims that such boundaries are themselves the product of social and human constructions. Human activity and nature exist in interaction, shaping landscapes which are dynamic and continuously contested in a process that is constituted by, and simultaneously constitutes, the political economy of access and control over resources.

Both insights carry with them a skepticism regarding universalizing truth claims that refines the search of the thesis: rather than aiming at the final truth about gender and irrigation, the objective is to continuously be able to ask the question about the meaning of gender in irrigation.

A first path I explore in my search (chapter 2) consists of a re-visiting and review of gender and irrigation studies that were produced in the last decades of the twentieth century. These were the first studies to strongly suggest existence of a linkage between irrigation development and a worsening of gender equity. They showed that the development of irrigation often went accompanied with changes in tenure and labor relations that causes women to lose control over resources and over the products of their own labor. The reviewed gender and irrigation studies can be broadly categorized in two sets of narratives.

The first category is formed by narratives that are useful to professionals working in irrigation projects, and are aimed to help them do their jobs better. Studies belonging to this category remain relatively faithful to the theoretical, epistemological and political premises of mainstream irrigation thinking, and are clearly inscribed in a modernization project of development. Although useful in making women visible, and getting gender on irrigation agendas, they have shortcomings in terms of their understanding of gender and change: the studies do not question what progress means to and for women, and uncritically accept that irrigation technologies and engineers as the main initiators and motors of development. They also display a highly diluted and questionable form of feminism as consisting of opening up the irrigation possibilities that have been extended to men to women as well.

The second category of narratives is provided by those studies that are more firmly inscribed in feminist agendas for social transformation – Marxist-feminism and eco-feminism. Studies based on these narratives clearly place irrigation development in wider processes of change, and offer interesting ways of linking that which happens within households and farms to larger political and economic processes. In the end, however, the underlying hypotheses of this second category of narratives tend to either:

- a) reject irrigation as a possible feminist road to development on the basis of its (intrinsic) patriarchal, capitalist and masculine characteristics, or
- b) approach irrigation as a rather arbitrary element in larger schemes of patriarchal and capitalist exploitation. (This automatically qualifies further explorations into the gender politics and dynamics of irrigation development and management processes as unnecessary, or at least as something that has no priority on feminist agendas.)

I use a discussion of these two categories to refine the conceptual contours of my search as consisting of the search for ways of linking the critique of the technological optimism, scientific positivism and theoretical humanism that are implicit in the more radical transformative feminist narratives of academics, with the more pragmatic and 'hands-on' solutions and analyses offered by the liberal and reformist feminist narratives of irrigation development practitioners. I have conceived of my project neither as the celebration of women's connection with the natural as a basis for condemning men's with the technological, nor as the simple embrace of the technological as a means to liberate women from the natural, but rather as a renegotiation of both gendered identities and scientific (and technological) rationalisms.

A second direction I have taken in search for answers to my query (chapter 3) asks why it is so difficult to see women, or ask questions about gender, in conventional irrigation thinking. I have identified three sets of reasons. A first stems from some of the more general features of irrigation thinking, such as its lack of a critical interpretative tradition and its cherishing of this lack as a virtue of modern science. These features are related to the positivist epistemological beliefs that guide much irrigation thinking. A second set of problems has to do with the way in which irrigation systems are defined, and how its boundaries are drawn. This shows in the choice of metaphors used for representing irrigation realities, metaphors that structure the world in oppositional dichotomies that are rather strongly associated with gender. Distinctions such as those between production and consumption, or between private and public, are for instance widely used in irrigation conceptualizations. It also shows in the ontological separation of the technical and the social, or between 'the system' and its context. A third set of problems has to do with the overall bracketing of power and politics from the analysis. This shows in the use of deductive methods and ideal-typical models, and in the direct association of much irrigation research with those who 'rule' irrigation systems. It also shows in the methodological individualism that characterizes much irrigation thinking, and in its narrow and rather functionalistic and instrumentalist concept of human agency. These three sets of conceptual problems are inter-related.

A last and third approach for finding answers to my quest (chapters 4 and 5 and 6) consists of a comparison between mainstream conceptualizations of irrigation realities with my own constructions of these realities, which I generated on the basis

of case-studies. I use the differences between the different representations to formulate further reflections about the possibilities for feminist ways of looking at irrigation.

In chapter 4, I do this by contrasting the findings of the study with - on the one hand - practical and intervention-oriented discussions on irrigation in Africa, and on the other hand with feminist debates on how to best represent and understand African women. The study consisted of a comparison in terms of labor allocation, productivity and division of benefits between irrigated fields allocated to men and those allocated to women, and between households in which only men have irrigated plots and those in which also women have irrigated plots. The findings of the study showed that labor productivity increased with the allocation of plots to women, and that women were more inclined to work in irrigated agriculture when they had their own plots. I use these findings to generate a number of challenging questions for thinking and conceptualizing irrigated farming in West Africa. The most important one of those has to do with the implications of different ways of looking at households. A conceptualization of households as more or less harmonious units that lies at the basis of plot allocation to only men is as inaccurate as a conceptualization as promoted by some liberal feminists of households consisting of individuals who operate more or less independently of each other. Households consist of networks of people who are inter-dependent and who bargain about the terms and conditions of these interdependencies within boundaries set by customs and laws.

In chapter 5, I present and discuss the findings of a gender analysis study conducted in the Chattis Mauja irrigation system in Nepal. This farmer-managed irrigation system has been the focus of many earlier investigations, that were done out of a fascination for its complex and well-performing management system. Those earlier studies identified the fact that 'all users were involved in its management' as one important factor explaining the high performance of the system. The gender study, instead, showed that a large part of the users - women - were not involved or included in system decision making and management. What this means for women's access to water, and for the assessment of the performance of the system are central questions in the chapter. They generate some interesting queries about feminist possibilities to seeing and theorizing irrigation realities. Important for instance is the question about where irrigation powers are located: are these mainly concentrated in the formal water users' organization, or is power more diffusely and widely distributed? The study findings suggest the latter option by showing how women, in spite of their exclusion from formal decisions, were quite well able to access the water they needed. These findings also raise doubts about the effectiveness of the often heard plea to increase the participation of women in water users' organizations as an empowerment strategy.

Chapter 6 in many ways resembles the exercise of chapters 4 and 5, in that it contrasts Andean irrigation realities as constructed on the basis of a review of gender and irrigation studies with other constructions of these realities. The difference with the previous chapters is that this chapter identifies, in addition to an Engineering and a Feminist version of irrigation realities, an 'andeanist' version. This last version is part of a discourse that is sometimes used to lend support to the struggle of indígena groups to protect their identities, livelihoods and properties. The co-existence of several conflicting representations, and of several very differently positioned knowers and sources of knowledge, raises questions that are of relevance to the thesis as a whole. These are questions about 'truth' and 'solidarity' and about the linkages between the two. These are also the larger questions of epistemology (what is true, which claims to truth are acceptable), of discursive authority and political representation (who has the legitimate authority to speak, and on behalf of whom), and indeed of solidarity (whom to identify with and whom to impress or convince). Do legitimacy and authority come with the most accurate representation, with 'seeing better' as is often suggested in many writings? Or do, instead, truths come into being because the powers-that-be recognize and endorse them?

In the last chapter I conclude that contemporary strategies to make women visible in irrigation have lost their effectiveness, because they continue to make use of mainstream irrigation languages and concepts. Because of this, women can only be made visible as 'the other', a process through which their gender identity comes to determine their irrigation identity. Or women can be made visible in terms of 'sameness' (to men, or to 'normal' irrigators), which renders gender irrelevant for irrigation thinking.

I show how a feminist perspective on irrigation differs from mainstream irrigation thinking. First, it shifts the conceptual boundaries between that what belongs to irrigation – and requires explanation by irrigation professionals – and that what falls outside of it. Second, its way of making sense of human behavior is different: rather than treating people as rational individuals whose irrigation behaviors are dictated by the internal characteristics of the irrigation system, a feminist perspective sees people as parties to sets of social relations. And third, a feminist way of making sense of irrigation involves questions about the relation between knowers and knowing, about the meaning and possibility of objectivity, and about the relationship between power and knowledge.

A plea for a feminist way of thinking about, and looking at, irrigation is an inherently political project. The contents of this project depend on the particular moment in time, and on the particular context. The contours of feminist ways of thinking also change with new insights. It maybe that there is a gradual change from how can *we* (feminist irrigation engineers) – a group of people that first needed to come into existence and gain legitimacy through more or less subtle forms of enticing and advocacy – learn to better see *them* (men and women irrigators), to:

under what conditions can *they* speak for themselves, represent themselves, and in the process hold *us* accountable to what we see and say. I therefore suggest that what is needed for positive changes in irrigation is not simply new forms of expertise, but also a democratic transformation of public irrigation and water debates and policy processes.

Samenvatting

In dit proefschrift beschrijf ik mijn zoektocht naar mogelijkheden om irrigatie te begrijpen en conceptualiseren op een manier die gender verhoudingen niet alleen zichtbaar maakt, maar waarin genderverhoudingen ook horen tot wat verklaard en ondervraagd kan worden. Aan de basis van deze zoektocht ligt de ondervinding dat het moeilijk is om vrouwen te zien, of genderverhoudingen te begrijpen, in normale en gangbare conceptualisering van irrigatie. Ik denk dat deze onzichtbaarheid van vrouwen en gender in gangbare representaties van de irrigatiewereld een belangrijke oorzaak is van genderongelijkheden in de irrigatiewereld, en hoop dat een betere manier van nadenken over irrigatie zal bijdragen tot het ter discussie stellen en zelfs verkleinen van zulke ongelijkheden.

Irrigatie is een echte mannenwereld. Rechten op water en geïrrigeerd land zijn veelal in handen van mannen, en de besluitvorming over irrigatie wordt ook door mannen gedomineerd. Manieren van spreken en denken over irrigatie kunnen ook als mannelijk gekarakteriseerd worden, vooral omdat ze het werk van vrouwen onzichtbaar of irrelevant maken en omdat ze denken over sociale en genderverhoudingen als irrelevant kenschetsen. Irrigatie is, tenslotte, ook een mannelijke beroepsgroep. De meeste irrigatieingenieurs zijn mannen, en professionaliteit is mannelijk geconoteerd.

De 'mannelijkheid' of masculiniteit van irrigatie is niet de natuurlijke orde der dingen, noch noodzakelijkerwijs een reflectie van de meest wenselijke of efficiënte manier om de irrigatiewereld te organiseren. Integendeel: de masculiniteit van irrigatie is een discursieve, culturele and ideologische constructie die irrigatie - als beroep, als professioneel domein en als technologie - een speciale status verschaft. Professionele irrigatievertogen, begrepen als bepaalde waarheden en representaties die gevormd worden door specifieke configuraties van kennis en macht, ondersteunen deze constructie door bepaalde manieren van denken en handelen als gepast en anderen als ongepast aan te merken. De onderkenning dat de constructie van irrigatievertogen samenhangt met bestaande identiteiten, bezits- en machtsverhoudingen vormt in het proefschrift de basis voor een kritisch feministische ondervraging van deze vertogen. Ik ga er hiermee vanuit dat taal en betekenisgeving belangrijke terreinen van (feministische) politiek en macht vormen. Conceptuele schema's en theoretische talen kunnen gezien worden als verschillende manieren om irrigatiewereldheden te beschouwen en te ordenen. Het boek gaat in op de vraag hoe verschillende conceptuele schema's en theoretische talen het mogelijk maken om vrouwen te zien of om genderverhoudingen te ondervragen.

Mijn conceptualisering van gender (hoofdstuk 1) bepaalt de richting van mijn zoektocht. Ik ga uit van een sociaal constructivistische opvatting van gender, die ervan uitgaat dat wat gender 'is' altijd samenhangt met de sociale relaties en context

waarbinnen betekenis aan man-vrouw identiteiten en verhoudingen wordt toegekend. Gender is hiermee een relatief begrip, zonder kern of essentie, en genderverhoudingen zijn per definitie onderhevig aan debat en her-interpretaties. Deze opvatting heeft gevolgen voor het zichtbaar maken van vrouwen en gender in irrigatie. Ten eerste: er kan niet vantevoren vastgesteld kan worden wie of wat degenen zijn die zichtbaar gemaakt moeten worden. En ten tweede zijn de taal en de termen die gebruikt worden om te representeren zelf onderdeel van wat gerepresenteerd wordt.

Een andere belangrijke theoretische inkadering van het onderzoek wordt gevormd door de ideeën zoals ontwikkeld door de 'Sociale Constructie van Technologie School', actor-netwerktheorieën en feministische denkers zoals Haraway. Deze ideeën plaatsen vraagtekens bij het onderscheid tussen 'natuur' (of biologie) en 'cultuur', en tussen 'technologie' en 'samenleving', en beargumenteren dat dit onderscheid vaak zelf het product is van sociale en menselijke constructies. Menselijke activiteit en natuur bestaan in onderlinge communicatie en interactie. Het is in de wisselwerking tussen mensen en natuur, of tussen het sociale en het materiële, dat landschappen en technologieën vormkrijgen en worden ontwikkeld. Dit gebeurt in processen die worden gevormd door, en tegelijkertijd een vormend onderdeel zijn van, een politieke economie van toegang tot en zeggenschap over hulpbronnen.

Dit theoretische raamwerk brengt een sceptische houding ten aanzien van universalistische claims op waarheid met zich mee, wat helpt om de zoektocht van dit proefschrift verder te preciseren: het gaat niet over een zoektocht naar de uiteindelijke en definitieve waarheid over gender en irrigatie, maar over het creëren van de mogelijkheid vragen te blijven stellen over de betekenis van gender in irrigatie.

Een eerste weg die ik insla op mijn zoektocht (hoofdstuk 2) bestaat uit het opnieuw lezen en onderzoeken van studies over gender en irrigatie uit de laatste decennia van de twintigste eeuw. Dit waren de studies die voor het eerst een sterk vermoeden deden rijzen dat er een verband bestond tussen de ontwikkeling van irrigatiestelsels en een verslechtering in gendergelijkheid. Irrigatieontwikkeling ging vaak gepaard met veranderingen in bezits- en arbeidsrelaties die ertoe leidden dat vrouwen de zeggenschap over hulpbronnen kwijtraakten, en minder over de produkten van hun eigen arbeid konden beschikken. De studies kunnen grofweg gecategoriseerd worden in twee manieren waarop ze de relatie tussen gender en irrigatie leggen.

De ene categorie wordt gevormd door verhalen en analyses die bruikbaar zijn voor mensen die werken in irrigatieprojecten, en die erop gericht zijn hen te helpen hun werk beter uit te voeren. De studies die in deze categorie thuishoren, blijven relatief trouw aan de theoretische, epistemologische en politieke premisses van het gangbare irrigatiedenken, en hangen een moderniseringsvisie van ontwikkeling aan. Hoewel nuttig in het zichtbaar maken van vrouwen, en in het agenderen van gender in irrigatiebeleid, is het begrip van gender en verandering dat deze studies

hanteren problematisch: er worden geen vragen gesteld over welke soort vooruitgang goed is voor vrouwen en gendergelijkheid, noch worden irrigatietechnologie of de irrigatieingenieur als initiators van vooruitgang ter discussie gesteld. Voorts hanteren deze studies een sterk verwaterde en uitgedunde vorm van feminisme: centraal staat het voor vrouwen toegankelijk maken van die voordelen van irrigatie waar ook mannen over beschikken.

De andere categorie van studies is duidelijker geworteld in meer kritische, feministische analyses en agenda's voor sociale verandering - Marxistisch-feminisme en ecofeminisme. Deze studies plaatsen de ontwikkeling van irrigatie in meer omvattende veranderingsprocessen, en reiken manieren aan om datgene wat gebeurt binnen huishoudens te koppelen aan grotere politieke en economische processen. De meeste studies in deze categorie concluderen uiteindelijk óf

- (a) dat irrigatie verworpen moet worden als een mogelijk feministisch veranderingstraject op basis van zijn intrinsieke patriarchale, kapitalistische of masculiene eigenschappen, óf
- (b) dat irrigatie moet worden gezien als een tamelijk arbitrair onderdeel van grotere processen van patriarchale en kapitalistische onderdrukking (waardoor verdere onderzoekingen naar de gegenderde politieke dynamiek van irrigatie *dus* zinloos worden).

Ik gebruik een bespreking van deze twee categorieën om de conceptuele contouren van mijn zoektocht verder te duiden als bestaande uit manieren om de kritiek op het technologische optimisme, het wetenschappelijke positivisme en het theoretische humanisme van de tweede categorie studies te combineren met de meer pragmatische en praktische oplossingen en analyses van de eerste categorie. Het gender project in irrigatie bestaat mijns inziens niet uit de verheerlijking van de band tussen vrouwen en natuur als basis om die tussen mannen en techniek te verwerpen, noch uit de omhelzing van technologie als de bevrijder van vrouwen uit knellende door de natuur opgelegde beperkingen. In plaats daarvan karakteriseer ik het project als bestaande uit een her-onderhandeling van gender identiteiten en wetenschappelijke (en technologische) rationaliteiten.

Een tweede weg die ik ben ingeslagen om antwoorden te vinden op mijn vragen (hoofdstuk 3) bestaat uit een onderzoek naar waarom het zo moeilijk is om vrouwen te zien, en om gender te denken, in gangbare irrigatie-opvattingen. Ik heb drie groepen mogelijke oorzaken onderscheiden, die onderling samenhangen. Een eerste groep heeft te maken met meer algemene eigenschappen van irrigatiedenken, zoals het ontbreken van een kritische reflectieve traditie en de positivistische epistemologische grondslagen van veel irrigatiekennis. Een tweede groep heeft te maken met hoe irrigatiesystemen gedefinieerd worden, en met hoe de grenzen van stelsels conceptueel worden getrokken. Dit gaat bijvoorbeeld over de keuze van de gebruikte metaforen die de irrigatiewereld structureren in oppositionele dichotomieën die sterk gekoppeld zijn aan denkbeelden over man-vrouw verschillen. Het onderscheid tussen produktie en consumptie, bijvoorbeeld, of dat

tussen publiek en privé worden vaak gebruikt door irrigatiedenkers, waarbij de eerste van groter belang worden geacht dan de tweede. Het gaat ook over de vaak gehanteerde ontologische scheiding tussen het technische en het sociale, of tussen 'het systeem' en de context waarbinnen het opereert. Een derde groep oorzaken heeft te maken met het feit dat macht en politiek buiten de analyse worden geplaatst. Dit is bijvoorbeeld merkbaar in het gebruik van deductive methoden en ideaaltypische modellen, en in het vaak directe verband dat bestaat tussen irrigatie onderzoek en degenen die deze systemen beheersen en beheren. Het is ook merkbaar in het methodologische individualisme van veel irrigatiedenken, en in het beperkte, functionalistische en instrumentalistische concept van menselijk gedrag dat veelal gehanteerd wordt.

Een laatste en derde weg (hoofdstukken 4,5 en 6) die ik insla op zoek naar feministische manieren om irrigatie te conceptualiseren bestaat uit een vergelijking van gangbare opvattingen van de irrigatiewerkelijkheid met mijn eigen constructies van deze werkelijkheid, die ik heb gegenereerd op basis van case-studies. De verschillen tussen de verschillende representaties leveren vragen op die ik gebruik voor een verdere reflectie over feministische mogelijkheden om naar irrigatie te kijken.

In hoofdstuk 4 contrasteer ik de bevindingen van een onderzoek over de organisatie van de geïrrigeerde landbouw op huishoud niveau in Dakiri, een kleinschalig irrigatiestelsel in Burkina Faso, met - aan de ene kant - bredere discussies over irrigatie in Afrika, en - aan de andere kant - feministische pogingen om genderverhoudingen in de West-Afrikaanse landbouw te begrijpen. Het onderzoek betrof een vergelijking naar arbeids-inzet en productiviteit tussen irrigatievelden die aan mannen waren toegekend, en velden die aan vrouwen waren toegekend, en tussen huishoudens waar alleen mannen irrigatievelden hadden en die waarin zowel vrouwen als mannen velden hadden. De uitkomsten van het onderzoek laten zien dat arbeid efficiënter aangewend wordt in huishoudens waar vrouwen ook velden hebben, en dat vrouwen eerder bereid zijn te werken in de geïrrigeerde landbouw als ze zelf kunnen beschikken over de oogst van de velden. Deze uitkomsten gebruik ik voor de formulering van een paar uitdagingen voor feministisch denken over irrigatie in West Afrika. De belangrijkste daarvan gaat over de beste manier om huishoudens te beschouwen ten opzichte van individuen. Huishoudens zijn niet de harmonieuze eenheden die verondersteld worden als nieuw te irrigeren plots alleen aan mannen worden gegeven, maar bestaan uit netwerken van mensen die onderling afhankelijk zijn en die onderhandelen over de voorwaarden van deze afhankelijkheid binnen door gewoontes en wetten vastgelegde grenzen. Het beschouwen van landbouwers als individuen die relatief autonoom opereren, zoals sommige liberale feministen bepleiten, is evenmin toepasbaar.

In hoofdstuk 5 presenteer ik de bevindingen van een studie uitgevoerd in het Chhattis Mauja irrigatiestelsel in Nepal, een stelsel gebouwd en beheerd door gebruikers. Dit stelsel is onderwerp geweest van vele eerdere studies die gedaan zijn vanuit een fascinatie met het ingewikkelde en goedlopende beheerssysteem dat tot stand is gekomen zonder deskundigheid van buitenaf. Waar deze eerdere studies het feit dat 'alle gebruikers deelnemen aan de irrigatiebesluitvorming' identificeerden als een belangrijke reden voor het goed functioneren van de beheersorganisatie, laat mijn onderzoek zien dat een groot deel van de gebruikers, namelijk vrouwen, niet betrokken zijn bij die besluitvorming. De vraag wat dit betekent voor de toegang tot water van vrouwen, en voor de beoordeling van het functioneren van het systeem, is centraal in dit hoofdstuk. Mogelijke antwoorden op die vragen leveren nieuwe inzichten op voor het nadenken over, en conceptualiseren van, irrigatiewerkelijkheden vanuit een feministisch perspectief. Belangrijk is bijvoorbeeld waar macht om irrigatiebesluiten te nemen gesitueerd wordt: bevindt die macht zich uitsluitend of vooral in de formele gebruikersorganisatie, of is die machtsverdeling diffuser? De uitkomsten van het onderzoek suggereerden het laatste door te laten zien hoe vrouwen, ondanks hun uitsluiting van de besluitvorming, er wel degelijk in slaagden aan water te komen. Dit roept ook de vraag op of het bepleiten van de vergroting van deelname van vrouwen aan die gebruikersorganisaties wel de meest geëigende strategie is om de irrigatie-macht van vrouwen ten opzichte van die van mannen te vergroten.

Het zesde hoofdstuk lijkt op de twee voorgaande hoofdstukken in dat het verschillende representaties van gender en irrigatie werkelijkheden met elkaar vergelijkt. Dit hoofdstuk gaat over kleinschalige irrigatie in de Andes, waar niet alleen een 'ingenieurs' en een 'feministische' versie van de irrigatiewerkelijkheid te onderscheiden is, maar ook nog een 'andeanistische' versie. Deze laatste versie is onderdeel van een vertoog dat gebruikt wordt ter ondersteuning van de strijd van indianengroepen in de Andes tot behoud van hun identiteit, levenswijze en bezit. Het naast elkaar bestaan van verschillende versies van de werkelijkheid, en van verschillende en anders gepositioneerde kenners en bronnen van kennis, levert belangrijke vragen op over 'waarheid' en 'solidariteit', en over de relaties tussen die twee. Deze vragen liggen in het verlengde van de grotere kwesties over epistemologie, autoriteit en solidariteit die relevant zijn voor het hele proefschrift. Zijn legitimiteit en autoriteit verbonden aan de meest betrouwbare representatie, met 'beter zien' zoals vaak gesuggereerd wordt? Of wordt iets als waar beschouwd als de bestaande machthebbers het als zodanig erkennen?

In het laatste hoofdstuk concludeer ik dat huidige strategieën om vrouwen zichtbaar te maken in irrigatie niet meer effectief zijn, omdat ze teveel gestoeld zijn op gangbare manieren van denken over irrigatie. Hierdoor kunnen vrouwen alleen zichtbaar gemaakt worden als 'de ander', waarmee hun vrouw-zijn hun irrigatie-

identiteit bepaalt, óf als 'dezelfde' (als mannen, of als de normale irrigeerder) waarmee hun gender identiteit er niet meer toe doet.

Ik laat zien waarin een feministisch perspectief op irrigatie verschilt van het gangbare denken over irrigatie. Ten eerste verschuift het de conceptuele grenzen tussen dat wat bij irrigatie hoort - en verklaart dient te worden door irrigatiedeskundigen - en dat wat er buiten valt. Ten tweede is er een verschil in hoe mensen en menselijk gedrag geïnterpreteerd worden: in plaats van mensen vooral te benaderen als rationeel handelende individuen wiens irrigatiegedrag gedicteerd wordt door de interne kenmerken van het irrigatiesysteem en de waterbeheersorganisatie, is voor een feministisch perspectief een opvatting van mensen nodig als deel uitmakend van sociale verhoudingen. En ten derde brengt een feministisch perspectief vragen met zich mee over de verhouding tussen de kenner en het gekende, over de betekenis en mogelijkheid van objectiviteit, en over de relatie tussen kennis en macht.

Het bepleiten van een feministische manier van denken over, en kijken naar, irrigatie is een politiek project waarvan de precieze inhoud afhangt van het moment, en van de situatie, en waarvan de contouren verschuiven naar mate het inzicht voortschrijdt. Langzamerhand is misschien de vraag niet meer zozeer hoe *wij* (feministische irrigatie ingenieurs) beter kunnen leren *hen* (vrouwelijke en mannelijke irrigeerders) te zien en representeren. De vraag die relevanter is, is: onder welke voorwaarden kunnen *zij* voor zichzelf spreken, en *ons* ter verantwoording roepen voor wat *wij* zien en zeggen. Ik eindig daarom het proefschrift met de suggestie dat het tot stand brengen van veranderingen in irrigatie niet alleen nieuwe deskundigheid vereist, maar ook een andere manier van het organiseren en genereren van die deskundigheid.

Curriculum Vitae

Margreet Zwarteveen was born in Drouwenermond (Borger), the Netherlands, on the 27th of February 1964. During her childhood, she lived (among others) in Curaçao and Rwanda. She studied Tropical Land and Water Use (*Tropische Cultuurtechniek*) at Wageningen University, starting in 1984. As part of her study, she worked with women groups in the North of Cameroon (1986). For a first research, she studied the viability of sprinkler irrigation systems in cooperatives in Sandinista Nicaragua (1989). In a second MSc thesis (1990), she was part of a group of five students who tested the applicability of insights from the Social Construction of Technology (SCOT) School for studying irrigation. During her study, she was also one of the initiators of a student group that was formed to improve the attention to women and gender in the study program of Tropical Land and Water Use. Margreet graduated in 1990.

After having done some odd teaching assistance jobs at the Wageningen University, Margreet moved to Colombo in Sri Lanka (1992) to start working as an Associate Expert with the International Irrigation Management Institute (IIMI, now International Water Management Institute or IWMI). At IIMI, she was responsible for initiating and developing a research program on gender and irrigation. She was involved in studying the linkages between gender and irrigation management and development in Nepal, Sri Lanka, Bangladesh, Niger and Burkina Faso.

After five years in Sri Lanka, Margreet spent some time with IIMI in México, from where she helped organizing an international workshop on Gender and Water, before returning to Wageningen (1998), where she was hired as a lecturer with the Irrigation and Water Engineering (IWE) group. In 2000, she became part of the gender staff of the Wageningen University while remaining based at the IWE group. In Wageningen, and next to working on her PhD thesis, she was involved in teaching courses on gender analysis and research methodology, in addition to providing inputs to courses on water development and management. In terms of research, she worked on questions of water rights and legal pluralism, and continued writing on broader gender and irrigation issues. As part of the Water Rights and Indigenous Law (WALIR) program, Margreet was involved in researching gendered irrigation questions in the Andean region, which also included critically analyzing neo-liberal irrigation and water management policies. She helped developing research projects on gender and water users' organizations in Nepal and Peru, and coordinated a fellowship program for female professionals in the water sector which was one of the activities of the Global Water Partnership (GWP). Margreet is involved in two large capacity building projects on Integrated Water Management in South Asia and the Andean region.

Cover design:

Robert Emile Smit.

Printing:

Grafisch Bedrijf Ponsen & Looijen B.V., Wageningen, The Netherlands.