KASSAR TRUST

Handpumps in the Himalayas for the First Time

CONTENTS

INTRODUCTION

Kassar Trust has developed a simple technique for installing handpumps for the first time for protected drinking water in the Himalayan zone. Construction work and installation can be completely carried out by local village level teams of trained "Jal Karmis" (water workers) and the whole work organised and managed by village level organisations (Samitis). Contribution and participation of the beneficiaries is a pre-condition, and not only establishes the real need, but leads to proper care and maintenance of the pumps by the users.

However, the primary objective of the Trust lies not in the construction of this or that number of handpumps, nor even in drinking water itself; the primary aim is to create "local capability". That is to say local capability to organise and implement environmental programmes. The environment crisis in the Himalayas is such that many of the main issues involve the daily activities of those who actually live on the land. Changes in their daily activities on the land and in the forest, and in the land-use pattern, cannot be effected without their willing collaboration. This will only come about if they perceive that they are to be benefited. This, therefore, is the most fundamental step to being able to bring about environmental change.

Drinking water is perceived by the villagers almost everywhere to be one of their greatest problems, and their greatest priority. In fact it has been said that many of the environmental problems of the Himalayas can be reduced to two key issues : women and water. Women, because women carry out most of the work on the land and in the forests; and water, because everything depends upon the availability of water, water for households, water for livestock, water for crops. Around a local solution for drinking water, the Trust has been able to encourage and strengthen village level organisations - the Samitis. It then became possible to introduce other programmes through the Samitis : improved agriculture; ferro-cement tanks for rainwater harvesting from roofs; LDPE lined tanks for small irrigation,; solar lighting for un-electrified villages; sanitary latrines; nursery schools; women's programmes; health & hygene; etc.

So, these individual programmes which were taken up by the Samitis because the villagers saw that they were benefitting from them, could gradually be related to the overall environmental situation and finally can be woven into a more comprehensive environmental catchment programme.

The usual way to describe a programme like this would be to introduce the problem, the environmental problems, the social problems, and then to go into the details of the actions and programmes proposed to solve some of these problems.

The environmental crisis in the Himalayas is a complex web of interrelated social and physical conditions, past and present, and turning the present trends towards environmentally better future horizons means realigning much of the fabric of this web. Since the single most influencial factor today is almost certainly the human factor, litle permanent change for the better can be expected without the active collaboration and involvement of the " people whon actually live on the land ". For this reason, the first and primary objective of the Trust is to create a "local capability" to plan, organise and carry out environmantal programmes, and that means on an entirely village level basis. There are two aspects to all environmental programmes; what to do physically, and how to do it socially. All to often, only the first aspect is considered, only bits and pieces of a programme are attempted, and this is implemented through outside employees and contractors.

Since the more dificult of these two aspects to resolve is how to do it socially, so that the changes become part of the social fabric and so persist, the crticial objective of the Trust's work lies here. For this reason, this report will now outline the programme by tracing the progress as it has occurred, leading towards its overall objective, rather than the more usual scientific presentation in the reverse.

2) Handpumps for the First Time in the Himalayan Zone

The Trust's programme started off as a simple way of implementing handpumps for the first time in the Himalayan zone and this was developed very early on in the work. It was said to be impossible because the concept of ground-water and a ground-water table only applies to the restricted regions of valley floors, and it was considered impossible to put handpumps on the mountain slopes where the concept of a ground-water table does not apply.

The Trust first demonstrated that handpumps could be installed high up on mountain sides, 2,000 ft above the river, in many cases very near the ridge line. It was then shown that installation and maintenance work could be entirely carried out by teams of trained local persons. It was finally demonstrated that with experience the trained "Jal Karmis" could also determine the sites for wells. Thus, based only on training and some financial inputs, iy will be possible for local organisations to carry out this work.

Fig.1 shows a picture of a typical installation near an upland village, on the upper slopes of a hill near the ridge line. This is the simplest of three basic types of installation developed by the trust. This type can be fitted with one of two basic handpumps: an India Mk. II type for community use, or more cheaply, a simple cast iron suction hand pump if it is for the use of one or two households only. The India Mk. II handpump in a slightly modified form has been found to be the most suitable and the most applicable pump for the applications found, and a standard model named "India Mark II Kumaon Model" is supplied from Delhi to the Trust's specifications.

In order to make it simpler for local level organisations in the region to start construction of handpump wells after having a "Jal Karmi" trained, the Trust encouraged a local man to start a hardware shop which would stock all the items required for the programme. This makes it easier for small organisations in the area to start the work, and make a single pump for example.

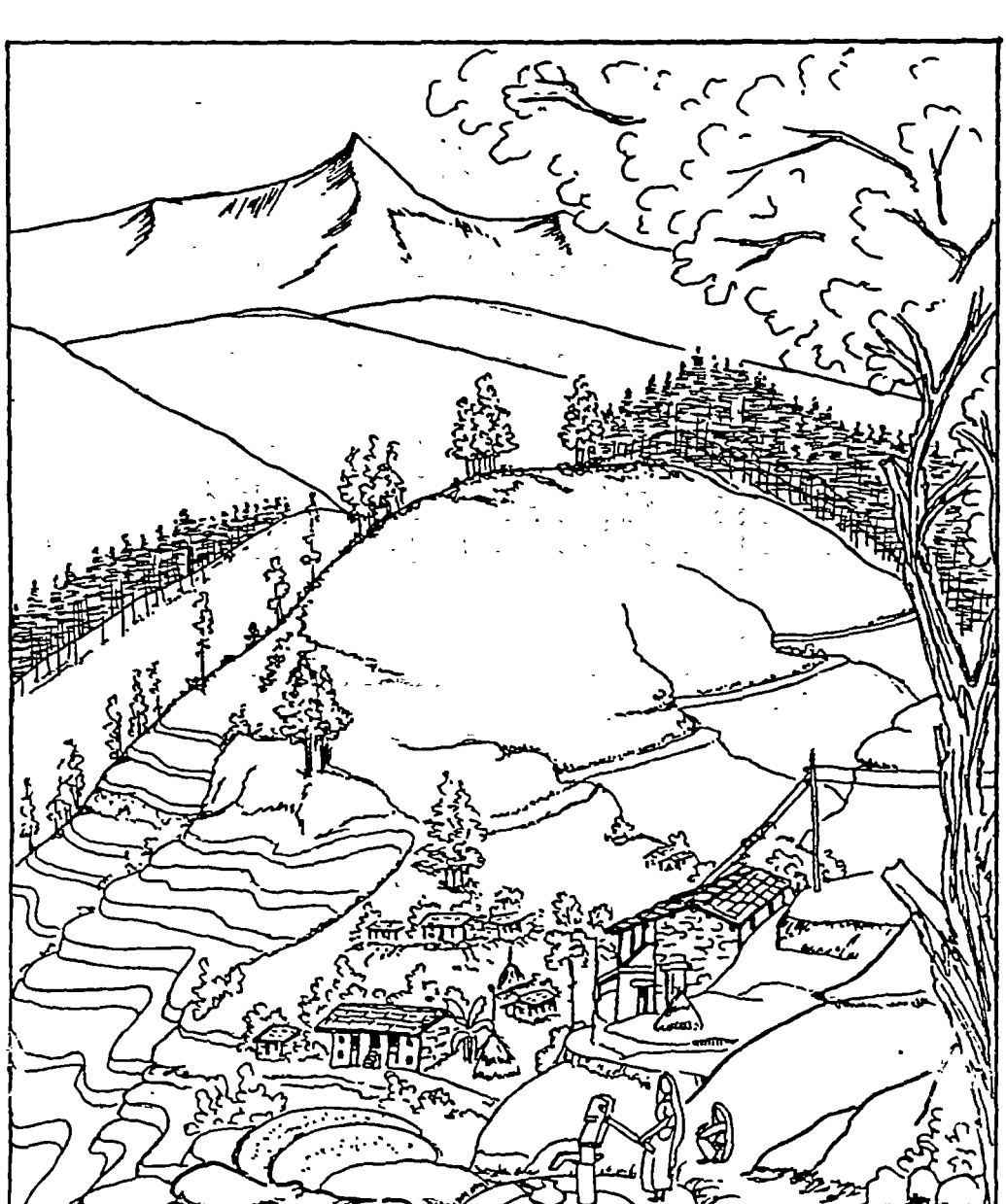

Fig. 1. Typical Handpump Installation in upland Village near the ridge line, 2,000 ft. above the river.

The source of water for the upland Handpumps lines in the small seepage zones to be found on mountainsides.

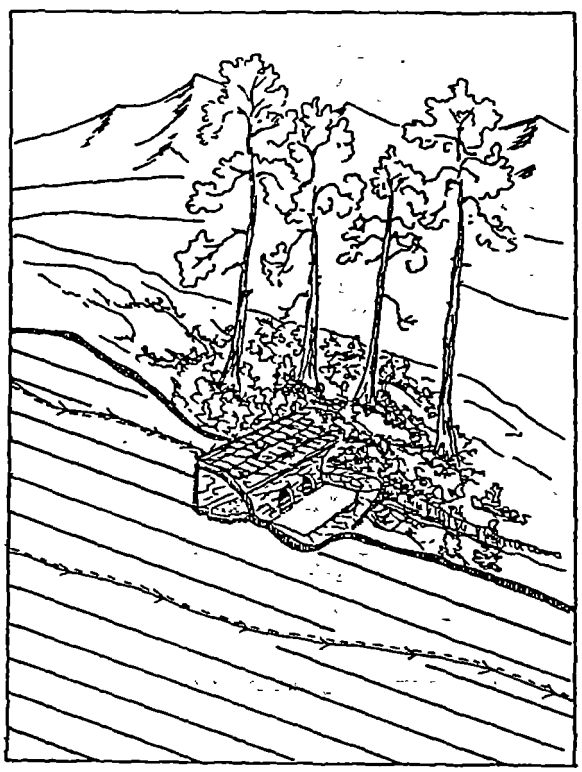

Fig. 2. Traditional "NAULA" or village drinking water source, shown fed by a seepage that reaches the surface. Lower seepages cannot be intercepted by a traditional Naula.

Fig.2 shows a "Naula" the traditional drinking water structure widely found in upland villages in the region. These structures have been traditionally built in the upland regions above the flowing spring line, and are located where a seepage in the mountainside issues out onto the surface. One hundred years ago this situation was fairly widespread, but with the shrinking forest, and a mixed forest reduced to mono-culture in pine, traditional water sources are widely either drying up or becoming seasonal.

A deeper seepage path is shown in the picture, which does not come out on the surface, but continues to seep on down the hillside. It is these seepages within the hillsides that Kassar Trust has been able to intercept with a simple underground structure. Of course, there are many more possibilities of finding a seepage underground that finding one which comes out on the surface, and so even with the drying up of water resources, and the drying up of Naulas, there are still many sites where underground seepages can be found.

Fig.3. shows the underground structure developed by Kassar Trust to intercept and store small underground seepages of the order of 1/2 litre per minute in the hillsides. This seepage often occurs at the soil-rock interface. The diagram shows an excavated pit with the seepage flowing into it. The seepage passes through a sand filter around the structure. The structure consists of a porous well at the bottom of the pit, capped by a lid, usully made of ferro-cement. A column rises from the lid to the surface, where a handpump is mounted on a platform. The platform has to be constructed so as to prevent any water pumped to the surface from returning to the well, and is provided with a drain to a downhill site for the purpose.

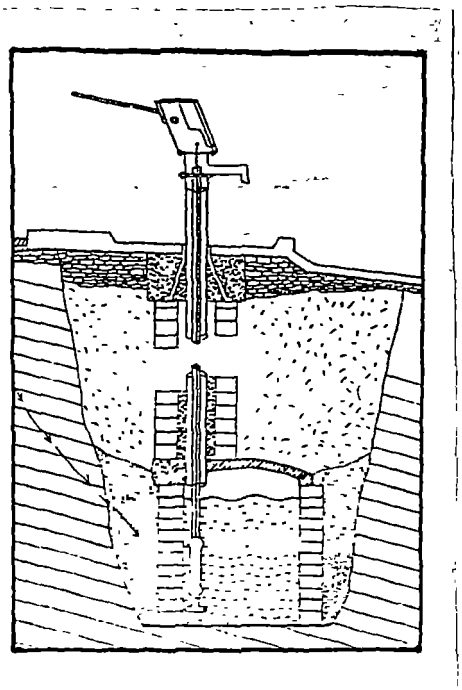

Fig.3. Diagram showing section through a handpump well, with seepage issuing from the left.

Although fairly simple in theory, the satisfactory construction of such a well requires that several stages in the construction are carried out with due precaution. It has been found that taking shortcuts during construction, something that untrained or partly trained persons quickly do, undermines the long-term stability and function of these wells. For trouble-free service it has been found that the full specifications must be adhered to, as these have been field tested over a number of years.

Since it quite often happens that the seepage source lies a some distance below the village or place of use, the Trust next developed a modification of this handpump well so that the water instead of coming out at the pump site, was pumped to a higher elevation through a pipe. It has been found in practice that the maximum practical vertical head through which water can be pumped by hand is around 60 metres, and the horizontal distance depends upon the length of line.

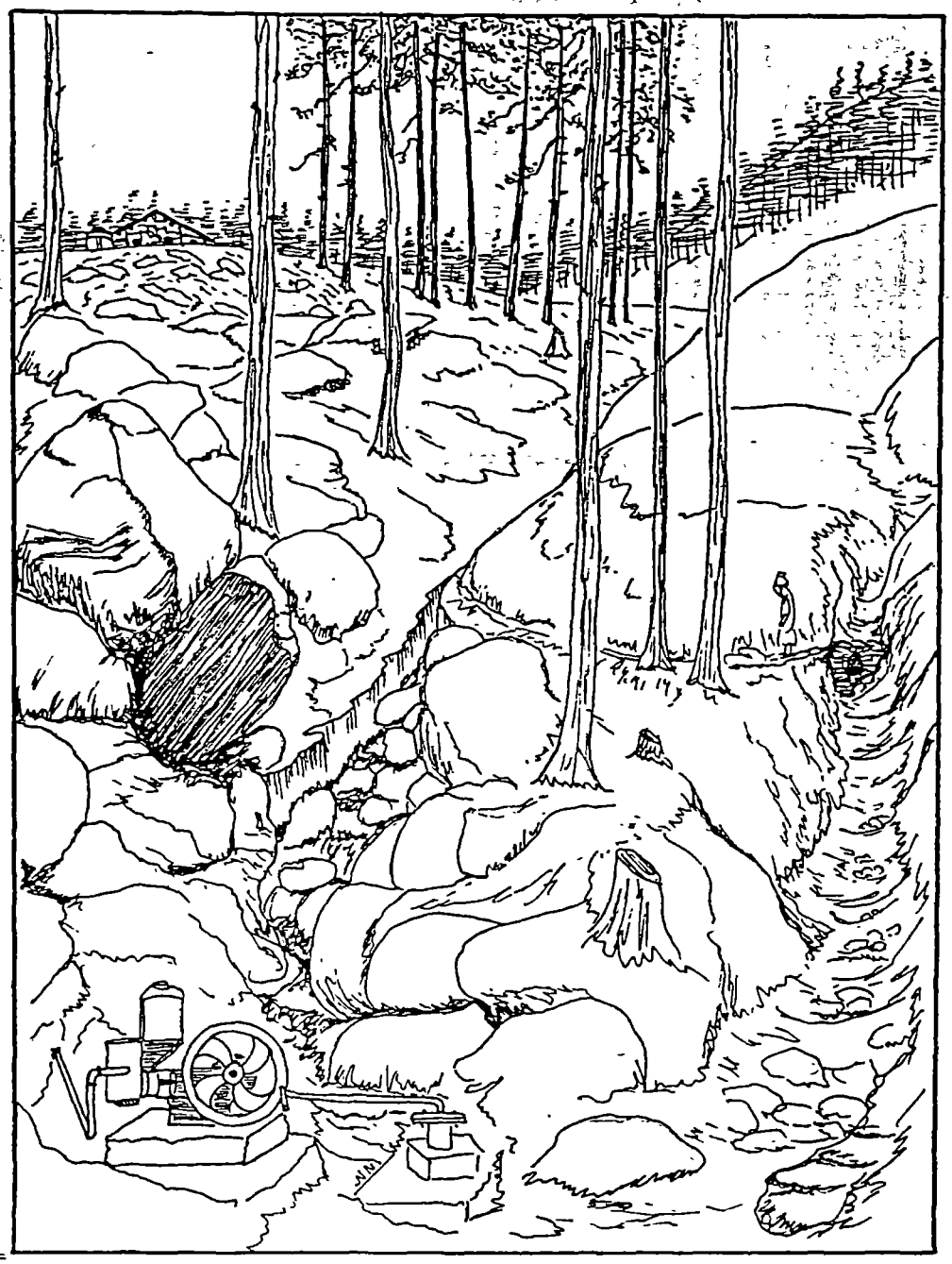

Fig.4. Force-lift Handpump installed on an Infiltration well. This picture shows an installation pumping to a ferro-cement tank in a school, 60 metres vertically above the pump,along a 400 m. pipeline.

The Third basic type of installation delveloped by the Trust involves the most difficult source conditions of all, and is used for extremely small and difficult sources, usually in hard-rock. In these conditions, a very small infiltration well is put on the source and the water is drained directly to a ferro-cement tank at a lower elevation by gravily, either for use there, or possibly for further pumping uphill.

Fig.5. shows a diagram of an installation like this.

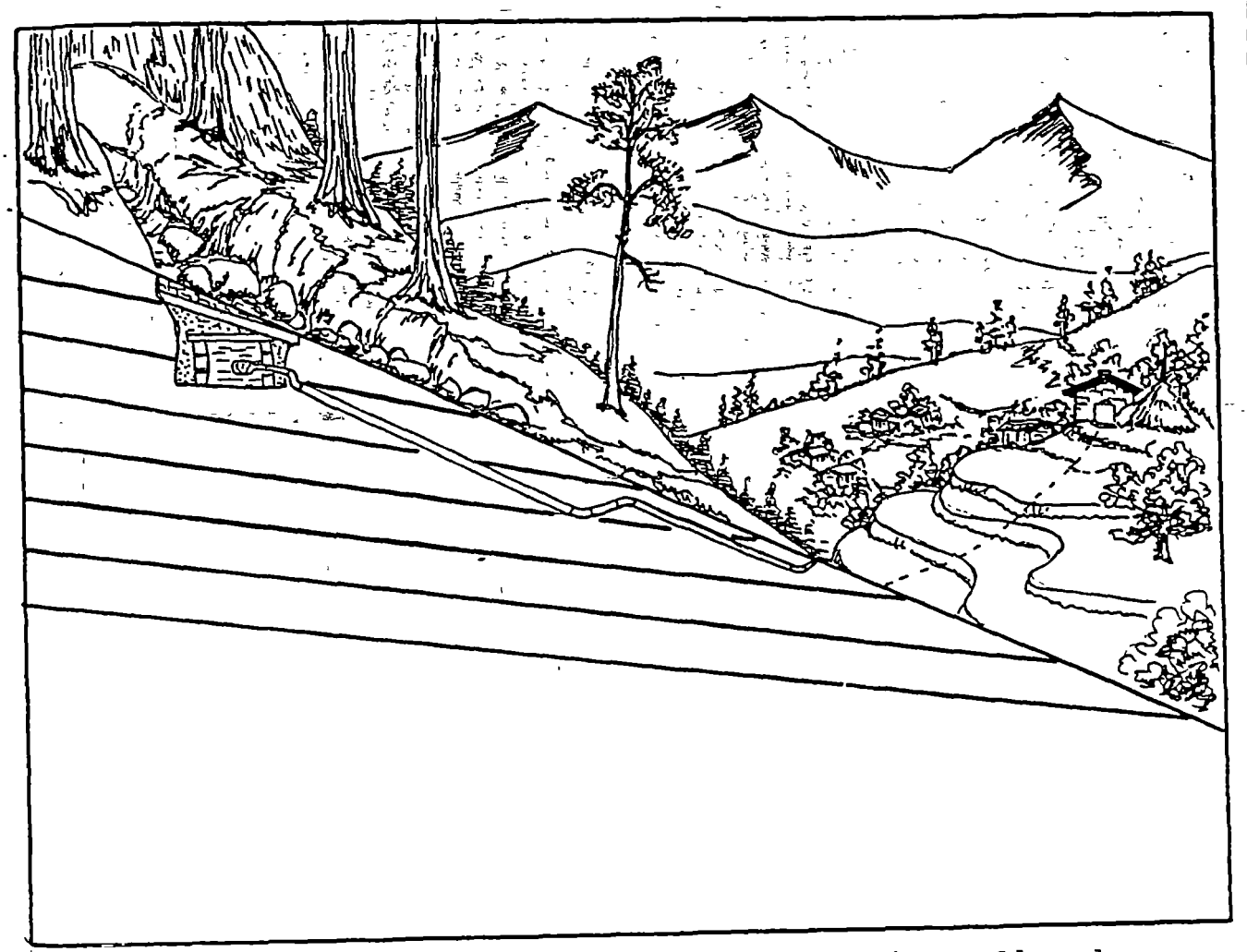

Fig. 5. Gravity scheme with small infiltration well and ferro-cement tank.

The technical details of the constructions are not gone into in this report. The Trust is going to compile a "Jal Karmi Handbook" for the use of Training Programmes and for Jal Karmis. More is mentioned under the section on Training in this report.

3) Methodology.

Since the Trust's prime objective is to create "local capability" special attention had to be paid to the methods of implementation right from the start. Of course it would have been easier to employ a small team of persons with a trained leader, and then to go about the work on a contract basis; this might have led to more wells but would not have led to peoples'participation and local capability. It is far, far more difficult to try to establish the whole work on the basis of a local system. Practice shows that training a team of Jal Karmis to carry out the actual construction work is the least of the problems. It is organising local village level organisations to be able to initiate, plan, organise, execute, and account for, the work that is the most difficulty task, and the task that proves to be the limitation on the amount of work that can be carried out.

From the very start, the Trust has insisted on carrying out any work at all only through a local Samiti, and never through an individual. A contribution has been insisted on from the beneficiaries, in the case of a handpump well including the digging of the well and other labour during construction as well as a monetary contribution amounting to approximately 10% of the cost. This monetary contribution is made to the Village Samiti to cover its operating costs, and as a means to make these Samitis viable local organisations.

The Trust never insists on any project, it only discusses a programme in response to a request from a village or group of beneficiaries. Inevitably, in villages, a lot of discussion is needed, and there is always some disagreement, so the process of initiating a project can be a very lengthy business. Experience shows that this stage cannot be short-cut; any effort to push ahead with a project immediately leads the village to believe that the implementers have something to gain from it, and immediately upsets the purpose. It also happens that disagreements surface after work has started, and in such cases the only course is to stop work and wait until such disagreements are resolved. Any effort to push ahead here also leads to disruption of the objectives. It is thus quite obvious that this type of work cannot be based on the "so many targets within such and such time frame" approach, and that some projects will be started and then left in the middle, often for quite considerable periods. The progress and achievements of such a programme cannot likewise be measured at all realistically by the targets of physical works realised. In order to work towards the prime objective of "local capability" therefore, a very flexible approach has to be resorted to, and ahdered to.

For these reasons, one has to decide right at the start of such a programme where the prime objectice lies; so many targets within a fixed time, or "local capability". Attempts to mix these two very different objectives gives very unsatisfactory results in practice.

It will now be obvious that the basic unit of operation is the Samiti, and much depends opon the structure of this social unit. Experience shows that best results are obtained where the Samiti operates in a fairly localised social unit of habitation, and where the leaders of the Samiti represent the major social groupings within that unit, and necessarily work well together. This latter constraint has found to work best where the members are fairly young, rather than where they are the older long-standing elders. This is because long-standing feuds often separate old elders, feuds that have nothing to do with the work in hand, but which operate to prevent such work moving ahead smoothly. Village societies being what they are, such a new Samiti, headed by relatively young leaders, and from all major sections of the society, can only really work if it has the tacit support of the elders. It is realised that these conditions are in practice difficult to reach.

What more usually happens, therefore, is that the Trust has not insisted on any one Samiti in any one location, in fact the Samitis do NOT represent any particular geographical location; they represent a social network, that often intermingles geographically. This happens in areas where more than one Samiti springs up to serve different parts of the community in one more or less geographical area, by a process of social affinity: ie the spatial spread of the Samiti is social and not geographical. Experience shows that this works best where the first model cannot be achieved. Experience shows that over a longer time span, this second model also tends to break down again into simpler units, as some Samitis work better than others, and the latter finally ten to merge with the former by a process of attrition.

In all respects, experience shows that it is preferable to allow full play to this process of mobility in the structure of Samitis, as it permits a gradually strengthening unit of Samiti to emerge. Insisting on the units of Samiti at the beginning is as deleterious to the process of "local capability building" as is prior determination of fixed targets within a fixed time. It has to stated once more that this social process does restrict the implementation of physical targets during the early growth years, and an understanding of the process and this result is required from all involved in the project. But in later years, as the social units of Samiti become more crystallised and formative, the schedule of physical work becomes more definate to plan and more consecutive in its implementation. This is because the Samiti not only becomes better organised at running its own work, but even crucially because it better understands how to relate to the beneficiaries of the programme, and how to relate to their needs and problems. In short, the beneficiaries of the programme, ie. the inhabitants of the villages covered, begin to understand the thrust of the programme, and themselves become involved with it and motivated to take initiatives themselves. In fact, the programme becomes their programe.

For the above reasons, Kassar Trust operates with only a skeleton staff of specialists, discarding altogether support staff like office staff, drivers, assistants, and all the others that are usually associated with such programmes. The Trust's Key Staff have to be able to carry out all these functions themselves, and they have to live in a village. This of couse puts a heavy strain on those key staff.

Two conditions have made it possible for the Trust to set up the project in this way:

First, all key staff are from a well known Ashram in India, and this gives them a position in society that the villagers can relate to.

Second, it was possible to obtain funding direct for the Samitis from an organisation in Kumaon, Uttrakhand Seva Nidhi, and so the Trust was not seen as a funding organisation by the Samitis, but as an organisation that was assisting them. It is also essential for Samitis to learn to handle their own funds as part of the exercise in achieving "local capability."

4) Training

Early training of Jal Karmis in the construction of handpump wells was difficult, as the Trust itself was in the process of experimenting with different techniques, and it wasn't until the various types had been standardised that training programmes as such became possible.

Two types of training have been tried out:

1) Trainees are attached to a Jal Karmi team for a period of three months or more and carry out all the work Jal Karmis are doing. Experience shows that this "on-the-job" training is the best for trainees from local village level organisations. Expereince shows that trainees on such programmes should have had pervious work experience on some related type of work and should come from the hill districts. Experience shows that young men who are not already trained artisans in any line are preferable to artisans who think they already know their trade. For example, masons who have worked for some time at brick-laying or at stone masonry usually think they know everything already, and are reluctant to the point of refusal to understand that work in a well is different from work on a building wall, and insist on doing things in their own way (which is not satisfactory).

2) A Workshop is held, during the course of which a handpump well is constructed during morning sessions, and lectures are given during afternoon sessions. This has in practice not proved a very satisfactory method of imparting training. The work during morning sessions is carried out by

skilled and experienced Jal Karmis, and the trainees tend to stand around and watch and then say everything is so easy. But experience shows that when such trainess come to construct a well later, they make so many mistakes about details and sometimes even major points, that the results are not at all satisfactory.

It also happens from this type of training that those attending return and engage a "local mason" in their own are, and this is usually disasterous, as masons habits are not suitable for this tpe of work at all. However, persons without experience or knowledge are likely to permit all sorts of errors to pass, and the long term prospects are not good, even if the result looks satisfactory to the untrained eye initially.

For the above reasons, the Trust has stopped holding short workshops, and for training emphasises that suitable trainees must first be selected from their own region, and then sent to work alongside a trained and experienced Jal Karmi for an initial period of at least three months. The trainee then has some idea of what is involved and can tell his own organisation what sort of preparatory work is required to make a well. Either more on-the-job work can follow, or a handpump well can be undertaken in the trainee's own area, with support from one or more trained Jal Karmis. It really needs about two years experience as a Jal Karmi on the first type of well before they can undertake most work unassisted. The reasons for this are that although the structure has been standardised to a very large extent, actual sub-surface conditions vary with each excavation, and considerable experience is needed in practice to enable a trainee to know what to do in the face of new conditions. Training on other types of well is only given to Jal Karmis who have constructed around 20 wells of the first type themselves.

5) Other Environmental Programmes.

Once Samitis had been established, they could take up other programmes. Some they could take up with funding from the Nidhi, sanitary latrines, pre-school nurseries, walled enclosures and tree plantation. As far as possible this was on their own initiative with only incidental help from the Trust, a technical improvement in the latrine piping, assistance in obtaining saplings, and things like that. Others were taken up through the Trust, improved agricultural methods, improved varieties of wheat, upland rice, and millet, introduction of vegetables for improved diet and for sale,poly-houses for seedling rearing, LPDE minor irrigation tanks, solar-lighting in un-electrified villages, fuel-effecient stoves, water-powered wheat grinding mills, ferro-cement units for roofs, concrete blocks for walls, ferro-cement window and door panels, etc. Some were joint programmes with the Nidhi, ferro-cement tanks for rain-water harvesting, etc.

6) Towards a Micro-catchment Programme - Implemented through Peoples' Participation.

These other environmental programes along with the original drinking water programme lead slowly along the road towards an environmental micro-catchment programme. The idea is that these, initially separate small programmes, should eventually link up into a more comprehensive micro-catchement programe; that is to say the individual programmes should themselves be components of a more comprehensive environmental programme based on the fundamental unit of environment, that is the catchment. It was stated at the beginning of this report that the social organisation of peoples' participation was the more difficult aspect of the work compared to the physical inputs, and so this report has narrated the story of the development of the Samitis to date. They are still some way away from being prepared to take up a micro-catchment as such, but the the individual programmes do form some of the components of a larger programme.

When it comes to a catchment programme, it becomes necessary to look at the problem from the other end again, that is to say "what to do", as at this stage the components of the programme have to add up to a whole.

7) Himalayan Environment - Basis of the problem : Bases for a remedy

When we talk of the environment, it tends to mean many things to many people. We should inquire what the basis of the environment is in relation to the specific question of the inhabited lands of the Himalayan range; it is on this ground that we can look at some of the basic problems and some of the answers.

Almost everyone is agreed that the basic unit of the environment in the Himalayas is the "catchment" (often called a watershed, although scientifically, the watershed is really the line dividing two catchments, on either side of which water is "shed" different ways). This at least gives some common ground to start on. The question then boils down to the "quality" of a catchment; what is a good catchment and what is a bad one. If we can agree on that, we are then somewhere towards seeing, in the most general terms, what we should be working towards.

Fig.6. Good Catchment.
Well forested slopes, broad-leaved trees, good soil cover : rain-fall is absorbed by the catchment, to be slowly released later.

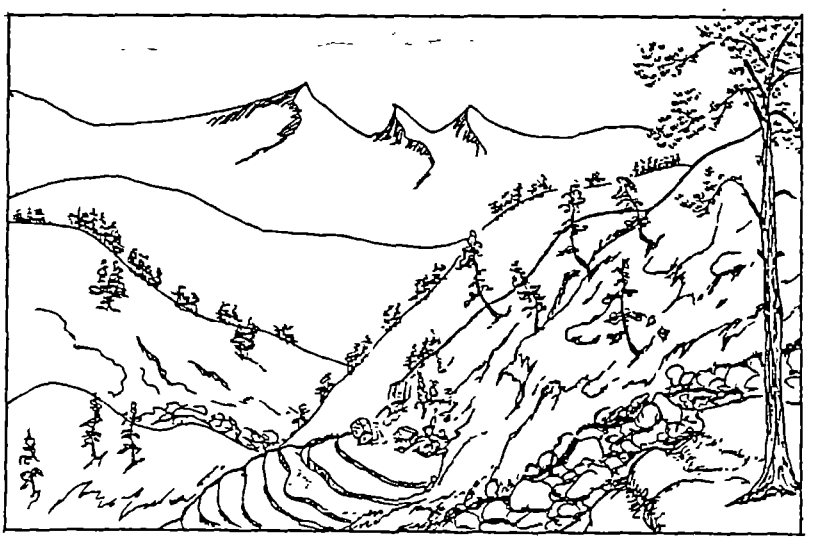

Fig.7. Bad Catchment.
Poory forested slopes, pine trees, no undergrowth, shallow soil : Rain-fall is not absorbed, but runs off. Water sources dry up. Large run-off causes soil-loss and erosion.

We see in the above drawings some of the features which distinguish a good catchment from a bad catchment. The quality of the catchment relates to the water cycle; if precipitation is stored in a catchment due to infiltration, this stored water is released slowly during the following period. Conversly, if

there is no or only little infiltration, then a large proportuin of the precipitation runs off, and there is no or only little water stored in the catchment, so the catchment is dry in periods of no rain. A result of large run-off is soil-loss and erosion, so we see that soil-loss and erosion are good indiactors of the health of a catchment.

One very fundamental measurement of the health of a catchment is therefore the relative amount of soil-loss and erosion. Large Catchment Programmes should therefore be monitored primarily on the basis of soil-loss and erosion, as this is the most basic parameter. This, too, can therefore be taken as a good base standard for preparing catchment and micro-catchment programmes. The most basic goal to head for is reduction in soil-loss, on the basis that in the most general sense this tends to govern almost all subsequent parameters.

It is thought that at around 100 - 150 years ago the inhabited region of the middle Himalayas was covered quite largely by mixed broad-leaved forests with pine only on drier ridges, as this represents the climax species there. Writings by travellors during that period usually refer to the fact that it was easy to travel in the Himalayas as one could easily purchase food and milk from the villages IN CONTRAST to the Plains, where it was more difficult. This shows the hill villages as being relatively far better off than the Plains villages in those days, in sharp contrast to today, when food has to be brought in from the Plains to feed the Hills. Today hardly any holding grows food from more than 6-8 months, and the remainder has to be provided by some family member working on the Plains.

Commercial extraction and various forest policies contributed to selective clearing of the forests, so that today only a thin cover in mono-culture in pine remains. Edidence points to the fact that concurrent with the reduction in forest cover and change from mixed forest to mono-culture in pine, a large soil-loss has taken place from the forest areas. Indeed, observations show that it is likely that a large proportion of the soil loss from the middle Himalayan zone over the past 100-150 years has taken place from forest lands that were then in mixed forest and are now in thin pine cover only.

Agriculture on upland farms in the middle Himalayas is dependent upon the forest for its cycle of life - estimates vary that for one Hectare of cultivated land between 7 - 20 Hectares of forest is needed to support it. Forest is needed for fodder, which in turn gives the manure for the land. Forest is also needed for fuel-wood. Forest lands also provide the store for water, and the source of water for most of the year. All this is now much reduced. In addition, the population has grown, and the land has been divided with each generation. The result is that the "carrying capacity" of the land is near the limit or already exceeded in many places.

If these are some of the basic issues and some of the basic problems, what are some of the bases for remedial action? A good basic indicator for all programmes is that the programmes should lead towards reduction in soil-loss as an ultimate goal, either directly or indirectly. We have already see that programmes cannot succeed unless carried out through peoples' participation, as this is the largest single factor. Therefore, we have to look for programmes that benefit the people who actually live on the land, whilst at the same time tend to lead to a reduction in soil-loss either directly or indirectly.

The two main land-use divisions on upland areas are cultivated land and forest land of various types. It is not too difficult to see, therefore, that we have to look to programmes of peoples' participation involving these two land-use divisions that lead directly or indirectly to reduction in soil-loss.

That may seem a tall order, and of course no one should imagine that it is easy. However, that is the only long-term solution.

It is relatively easy to measure relative soil-loss in terms of the above requirements, ie. for comparative purposes. The author has been very kindly assisted in the matter by the staff of the Institute of Hydrology, Plynlimon, Llanbrynmair. The suggested method involves calibrating a stage section by Gulp Dilution Method, and only requires one stage recorder and two rain gauges subsequently.