KILIFI WATER AND SANITATION PROJECT

WATER, HYGIENE AND SANITATION SEMINAR FOR TEACHER's

KILIFI, 10th – 21st APRIL 1992

TIME-TABLE FOR TEACHERS SEMINAR ON HYGIENE EDUCATION AND SANITATION TO BE HELD AT KIBARANI SCHOOL FOR THE DEAF STARTING 10th AUGUST,1992 TO 21st AUGUST,1992

DAY/DATE	8.00-10.00		10.30-12.30		14.00-16.00	19.00-20.00
MONDAY 10/8/92	Arrival of participants	T	Overview of KIWASAP's Activities- Mr.Mwangi Official opening: By Mr. J.K. Thoya	L	Introduction to hygiene education and sanitation Mr. Nyongesa	Dinner
TUESDAY 11/8/92	Elements of personal hygiene Mr Nyongesa	E	Homestead hygiene & Planning Mr Nyongesa	U	Introduction to V.I.P latrine construction Mr. Hatibu	"
WEDNESDAY 12/8/92	Transmission of diseases Mr. Vijselaar	A	V.I.P latrine construction (theory) Mr. Hatibu	N	V.I.P latrine construction (Practicals) Mr. Hatibu	"
THURSDAY 13/8/92	Common faecal-water related diseases Mr. Nyongesa	B	Child care District Public Health Nurse-Kilifi hospital	C	"	"
FRIDAY 14/8/92	Methods of combating faecal-water related diseases, Mr.Nyongesa	R	Presentation of group reports on how to combat faecal-water diseases Mr. Vijselaar	H	Departure of participants for a weekend break	N/A

MONDAY 17/8/92	**Arrival of Participants**	**E**	**Review of previous week's work Vijselaar/Nyongesa/Hatibu**		**Introduction to ferrocent water tanks Mr. Z. Ali**	**Dinner**
TUESDAY 18/8/92	**How to improve hygiene education and sanitation in schools Mr. Nyongesa**	**A**	**Group reports on improvement of hygiene education & sanitation Mr. Vijselaar/Nyongesa**		**Introduction to water filters Mr. Z. Ali**	"
WEDNESDAY 19/8/92	**Water usage Mr. Vijselaar**	**K**	**Balanced diet District Nutritionist Kilifi hospital**		**How to improve hygiene education and sanitation in communities, Mr. Vijselaar/Nyongesa**	"
THURSDAY 20/8/92	**Malaria control Dr. Snow-KEMRI Kilifi**		**Malaria control Dr. Snow-KEMRI Kilifi**		**V.I.P latrine construction(practicals) Mr. Hatibu**	"
FRIDAY 21/8/92	**Introduction to inter-school hygiene and sanitation competition Mr. Vijselaar**		**Course evaluation Mr. Vijselaar/Liyal**		**Closing of course By D.E.O Mr. Mbiti**	

K I W A S A P

TABLE of CONTENT
for TEACHERS COURSE/SEMINAR in
WATER, HYGIENE EDUCATION AND SANITATION

Division of material as according to subject:

1. Introduction
2. Water
3. Hygiene Education
4. Common Water & Faecal Related Diseases
5. Nutrition and Child Care
6. Community Participation
7. VIP-Construction and Siting
8. Articles & Kiswahili Handouts
9. Glossary
10. Miscellaneous, like discussion papers

The first column in each of the tables gives the page number within the Chapter. The second column gives the heading used for the material. In the third column a short description of the material is given.

1. INTRODUCTION

1	Kilifi Water and sanitation project	Kilifi situation and needs of water supply and sanitation with a summary description of the project
7	KIWASAP	A one page article with the aims and how to achieve the aims

2. WATER

1	Introduction	
2	The Water Cycle	A description of the movement of water through the atmosphere and water quality, standards and general tests
5	Drinking Water Quality	Short description of chemical properties
6	Microbiological Quality	Short description on save water
7	WHO Guidelines	
8	UNICEF's upward-flow filter	Inexpensive water filter for about ten people, a brief explanation
11	Water collection and extraction	The collection and possible distribution of water, summing up methods like roof catchment etc.

3. HYGIENE EDUCATION

1	Water and Excreta-related infections	Classification of diseases and their mechanism of transmission
7	Environmental classification of Excreta-related infections	Table of water-related categories and infections
9	Personal Hygiene	Introduction and Basic Guidelines of Cleanliness
17	Home Hygiene	Hygiene in and around the home

4. COMMON WATER & FAECAL RELATED DISEASES

1	Transmission of Communicable diseases	Six factors, all of which must be present, with a short description of each of the factors
5	Transmission of Diseases	Pictorial view
6	Transmission Routes	Pictures of the routes only
8	Amebiasis	Short description of disease and its schematic life cycle
9	Ascariasis	Description, acquisition and its complete life cycle
11	Bancroftian filariasis	Elephantiasis - description and schematic life cycle
13	Cholera	Short description and schematic cycle
14	Diarrhoea	A major public health problem, short description and risks and the causative agents of diarrhoea
16	Hookworm	Description of hookworm and its acquisition and its complete life cycle
19	Malaria	Complete explanations of disease, life cycle and prevention.
33	Scabies	Short description of pest
34	Schistosomiasis	Short description
35	Yellow fever	Short description
36	Worms & Wells	Game about worms

5. NUTRITION AND CHILD CARE

1	The Proper Way to Care for Young Children	Breast feeding, Kenya National Policy on Infant Feeding Practices, Immunization, control of diarrhoeal disease in young children.
6	Nutrition	Malnutrition
8	Balanced Diet	About balanced diet, common nutritional problems

6. COMMUNITY PARTICIPATION

1	Community Participation	Various forms of Community participation in the context of Hygiene education
6	Definition of Community Participation in the Context of Hygiene Education	Hygiene education in connection to the Community

7. VIP-CONSTRUCTION

1	Introduction to VIP-Construction	A detailed introduction with a description of all components of a VIP-Latrine
5	Placing of VIP-Latrines	Points to be aware of when placing a Latrine
14	Calculations VIP-latrines	Calculating the effective pit latrine, design life and VIP latrine design options
15	Practical on VIP-Latrine Construction	Notes on setting out of latrines
23	Stabilised Soil Blocks	Practicals on Stabilised Soil Blocks
28	Pit Linings	Setting out and Construction Pit Linings
30	VIP Shelter	Introduction and Construction VIP shelters
37	Maintenance	Maintenance of the VIP-Latrine, each structure needs it maintenance
39	VIP Latrine Design Options	Various choices one can make with VIP-Latrines depending on soil type and living situation
40	A guide to sanitation selection	A guide to selection of a type of latrine with the help of a flow diagram
43	Flies associated with pit latrines	Different types of flies associated with latrines and the methods of controlling flies in pit latrines

8. ARTICLES

	The Taboos that can kill	Kilifi District, Malnutrition because of cultural beliefs
	Promoting Hygiene habits that protect against diarrhoea	Hygiene measures to prevent diarrhoea
	Ventilated Improved Pit Latrine	Pamphlet in Kiswahili on VIP-Latrine in general
	Pit Linings	Pamphlet in Kiswahili on Pit Linings
	Squatting Slabs	Pamphlet in Kiswahili on Squatting Slabs
	Maintenance	Pamphlet in Kiswahili on Maintenance
	Tools	Pamphlet in Kiswahili on Tools
	Rain Water Harvesting	Pamphlet in Kiswahili on rain water harvesting
	VIP-Latrine detailed	Pamphlet in Kiswahili on VIP-Latrine in cooperating all previous documents on the subject

9. GLOSSARY

1	Glossary	Terms used and words of interest explained

10. Miscellaneous

Overview of KIWASAP's Activities prepared as an introduction at the start of the **Teachers' Seminar on Hygiene Education and Sanitation** at the **Kibarani School for the Deaf** from **Monday, 10th** to **Friday, 21st August, 1992.**

Definition of KIWASAP

KIWASAP is an acronym of the longer name form, Kilifi Water and Sanitation Project, which is a Community Water and Sanitation Project implemented within the Ministry of Water Development.

KIWASAP is funded jointly by the Kenya Government through the Ministry of Water Development and the German Government through the German Agency for Technical Co-operation (GTZ).

What does KIWASAP want to Achieve? - OBJECTIVES

KIWASAP has its Primary objective as the improvement of the general health of the beneficiary communities through the provision of safe and clean water on one hand, and promotion and provision of appropriate sanitation and Hygiene Education on the other hand.

Activities being implemented to achieve these objectives include:-

1. Water Supply either in the form of piped water, dams, water pans and wells, or in the form of roof water collection in tanks;
2. Demonstration and provision of appropriate Rural Sanitation in the form of Ventilated Improved Pit (VIP) Latrines; and
3. Hygiene Education and Promotion of the employment of recommended practices.

Where does KIWASAP Operate ? - PROJECT AREA.

KIWASAP is at present active in parts of Bahari and Ganze Divisions.In Bahari Division, the Project is active in Kapecha-Mkomani, Pingilikani - Dindiri, Ng'ombeni and Mwele.

In Ganze Division, the Project is busy in Bamba and Digiriya Locations and has so far gone to Bamba, Mitsemerini, Chapungu, Jila, Kidemu, Mirihini, Manyango and Kitendewa.

How does KIWASAP Hope to achieve these goals? - METHODOLOGY

The Project employs many methods to achieve these goals outlined above. The methods are grouped together as follows:

1. Making contacts to establish Community Priority areas through meetings and other contacts;
2. Direct Implementation of both water and sanitation projects;
3. Education of Community Members through seminars, shows, direct contact, etc; and
4. Demonstration and promotion of appropriate water and sanitation technologies.

Why does KIWASAP deal with teachers?

Primary Schools are important institutions which invest in the human resource of this country through education as the saying goes in the "leaders of tomorrow". In addition, there are several factors favouring the choice of Primary School Teachers as an important avenue of spreading project objectives and activities. These are:-

1. Teachers have a good educational background and as such do not only understand the information the project wishes to project, but also help

in interpreting it to the pupils and the Parent Teacher Associations (PTAs);

2. They have a daily teaching routine and may take opportunity to chip in project aspirations as will be appropriate and natural for the pupils;
3. They have direct contact with parents through PTAs and otherwise- a situation that is fertile for positive feedback on the actual impact of the project;
4. That Primary Schools are, on the whole, equitably spread out within the population gives them the advantage of reaching a considerable part of the population within the project area; and
5. Primary Schools are permanent institutions both physically and socially. As such, demonstration facilities installed on them are there to stay.

What therefore is the Role of Teachers?

Needless to say then, Teachers are capable of playing an important role in the development of the project.

In short, teachers will be able to:-

1. Create contact with and educate parents of the school going children;
2. Educate school going children;
3. Demonstrate technologies in the school compounds; and
4. Promote technologies through competitions in the form of songs, plays, etc.

Today's Seminar

The last teacher training held in April this year was specifically organized for Headmasters and Deputy Headmasters. However, to better utilise the human resources and achieve a greater impact of success, there was a felt need that the training facility should be extended to the teachers.

This opportunity of being at the Kibarani School for the deaf not only offers a good seminar environment, but also enables broader inter-personal interaction. In

addition, it offers the long enough duration required for practical exercises that can be followed to the end.

As such, while wishing you a good start of the seminar on a high note, I also wish to take this opportunity on behalf of the Project and the participants, to again thank the School Administration for allowing us the time and space to conduct the seminar.

Thank you,

(S.G. Mwangi)

PROJECT MANAGER

Kilifi Water and Sanitation Project

The Kilifi Situation and Needs for Water Supply and Sanitation

Kilifi District is in the Coast Province, to the North of Mombasa and covers an area of 12,523 sq. km. The District is divided into four administrative divisions, and has a population of 430,986 (1979 census). The population distribution corresponds closely to agro-climatic zones with highest densities lying in the Southern coastal plain and foot plateau where agricultural potential is highest.

Ethnically, Kilifi District is predominantly inhabited by Mijkenda tribes of which the Giriama are the majority. Arabs form most of the non-African population closer to the coast. Their historical and social origins have had a strong influence over the local people's cultural values and religion.

Kilifi's climate is influenced by its geographic location lying near the sea and its altitudes that range from 0 - 300 m. Temperature variations are small, the average temperature being 25° C. The rainfall is bimodal occurring during the months of April to June, and October to December, and varies from 1090 mm at the coast to 600 mm per annum in the Nyika plateau.

The Nyika plain is the largest, driest and consequently least inhabited area in the district. It is gently undulating and sparsely covered by vegetation. It is classified as semi-arid. The project locations of Kayafungo and Bamba are located on this plain.

There are many diseases infecting the population that are related to Water Supply and Sanitation. Those without adequate water for cleansing purposes and proper excreta disposal facilities are particularly susceptible. The most

important endemic diseases in Kilifi District are malaria, bilharzia and diarrhoea.

Sanitation is a very important intervention in combating these diseases. Proper excreta disposal cuts fecally transmitted diseases such as diarrhea at its source. It is for these reasons that the project incorporates three interventions (1) adequate clean water supply, (2) sanitation and (3) hygiene education.

There is no way of generalizing the prevalence of disease infections even within the selected project areas. The Wellcome Trust Medical Team operating out of Kilifi Hospital have begun longitudinal studies on scattered clusters of people along the coast and the Kilifi/Ganze/Bamba corridor. Their studies have underlined that disease patterns vary considerably from one location to the next. Initial tests show that bilharzia is low in Bamba but high in Gongoni.

Malaria is an important disease in both populations but hookworm and ascariasis are both low in Bamba and slightly higher in Gongoni.

It is felt that hygiene education efforts will be successful in achieving improvements in sanitation and hygiene practices. It is strongly recommended therefore, that water supply, sanitation and hygiene improvements be regarded as one package and that all three be implemented in parallel.

Summary Description of Kilifi Project

The semi-arid nature of most of the Kilifi District causes water being the highest priority to both people and government. The project aim is therefore, to meet this priority in providing water supplies to a large population in the most water-short areas. It also takes advantage of the opportunity to introduce appropriate technology for both water supply and sanitation into the District. Just as importantly, it intends to introduce methods of implementation and

operation and maintenance that are consistent with the District Focus Policy incorporating strong elements of community participation.

Executing and Collaborating Agencies

The Kilifi project will be an integrated program covering several sectors to be carries out by their respective Ministries. The participating ministries are Ministry of Water Development, Ministry of Culture and Social Services, Ministry of Health and Ministry of Education, Science and Technology. The District Development Committee will also play a major co-ordination role within the District.

Community Participation

The project will capitalize on the water priorities and organizational abilities by taking traditional approaches (strengthening rather than changing) to self-help activity. The women's groups will, therefore, be key organizations in support of the water project.

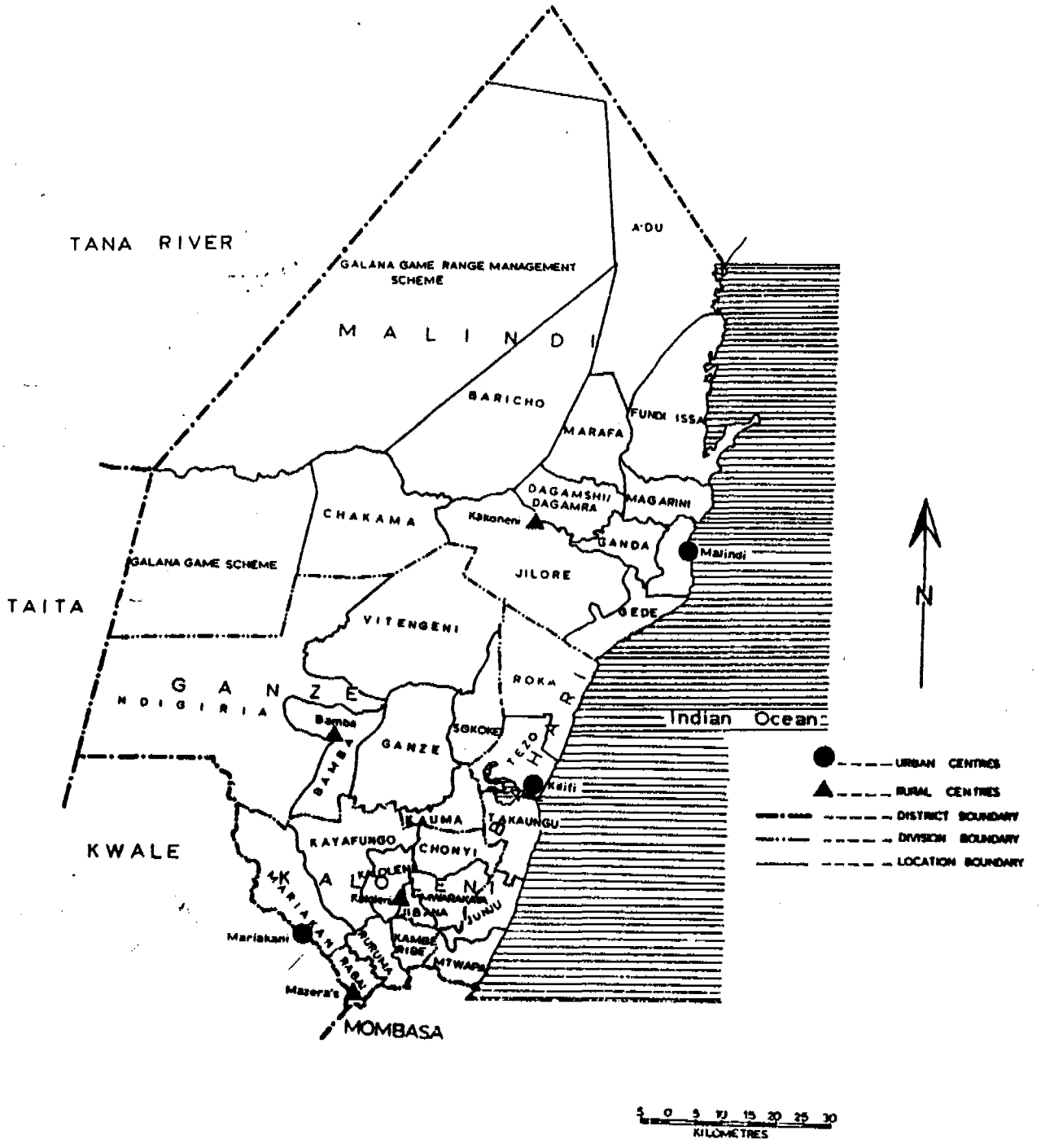
Hygiene education will be brought to the community through the schools within the existing curriculum. Teachers will be provided in-service training and additional educational materials in support of their efforts. The project will continue to provide monitoring and support to the teachers throughout its length. The public health technicians will bring hygiene education to the women's groups and other adult organizations within the community. They will also make home visits for the purposes of monitoring and education.

Sanitation will use the improved pit latrine and pour flush toilets where appropriate.

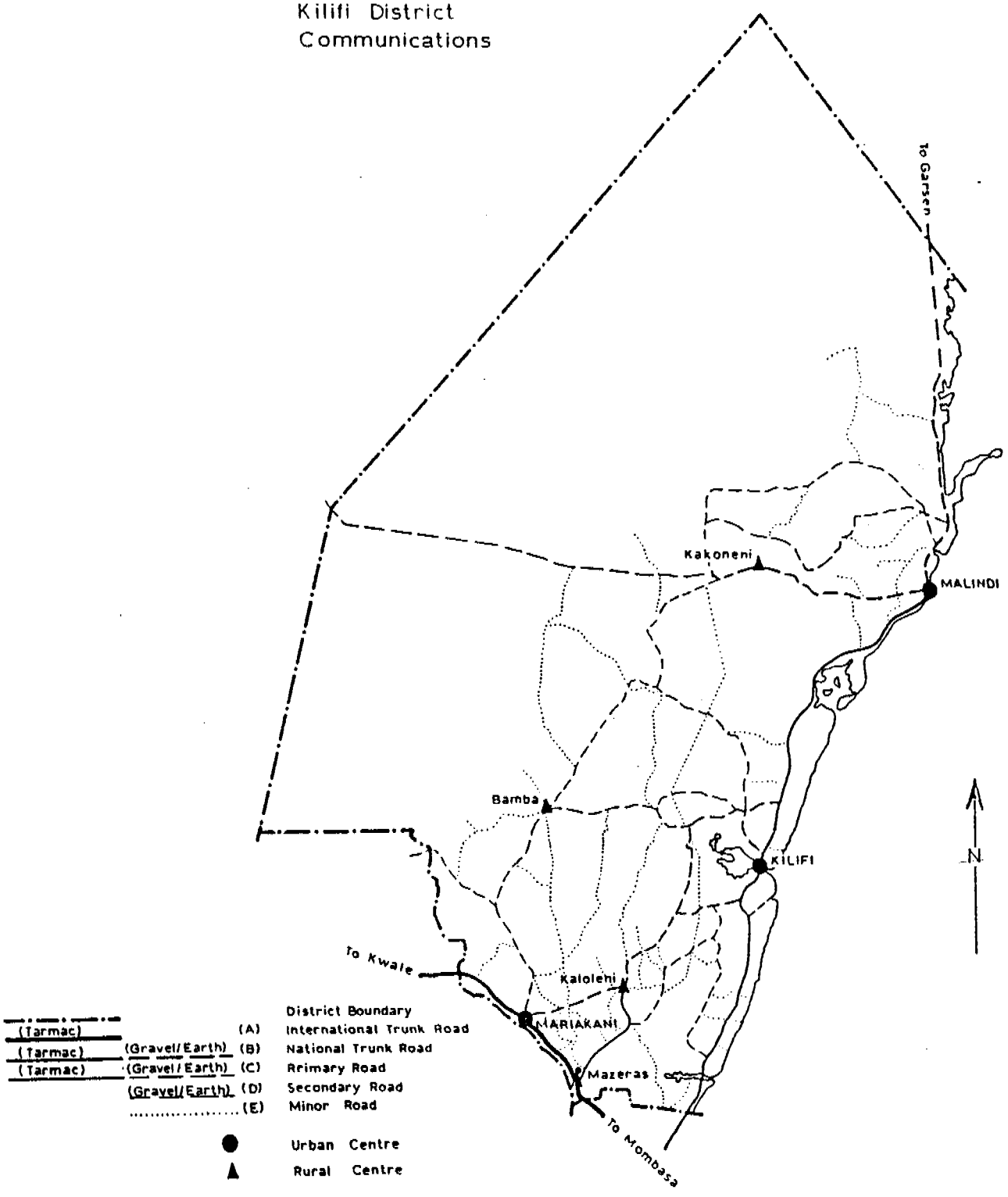
Location Of District

KILIFI DISTRICT

ADMINISTRATIVE BOUNDARIES



Kilifi District
Communications



KILIFI WATER AND SANITATION PROJECT

KIWASAP

Kilifi, June 1991

Kilifi Water and Sanitation Project

The project is a Ministry of Water Project and covers part of the Bahari Division and Ganze Divisions in Kilifi District.

The aim of the project together with Social Services, Public Health and Education Ministries is:

- To educate the communities on Water, Hygiene and Sanitation.
- To educate the school children in the schools on Hygiene and Sanitation.
- To provide knowledge and needed materials to get appropriate drinking water.
- Wells, water pans, water catchment or pipe line construction as appropriate.
- To provide knowledge to build the VIP-latrine.
- To provide subsidised VIP-latrine slabs and vent pipe with mosquito gauze.

To achieve the above aims the project will:

- Work closely with communities and collaborating ministries through provision of transport and allowances to personnel to visit the project areas as needed.
- Provide means for educational material and possibly meet training needs for the Communities. The material to be on video or slides or whatever audio-visual material is the most appropriate.
- To produce VIP-latrine slabs as needed and to make them available to the communities.
- To educate artisans in making of the slabs so that the knowledge is directly available in the community.

By educating at least one teacher in each school in the project area, there will be a resource person in each area to answer questions on water and sanitation.

The project will have to use every means to disseminate the Sanitation component so as to succeed. The project will have to rely on the resource persons to make locally acceptable education materials.

INTRODUCTION

Water is essential to live and is required daily in sufficient amounts to survive from day to day.

Water is a problem in many African countries. In 1985 an estimate was made that 42 percent of rural and 77 percent of urban population have access to fresh water. There are some countries were less than 5 percent of the rural population have access to safe water. Women are more affected by fresh water scarcity as they are responsible for the household water supply and as their role within the local economies. This becomes a severe problem during the dry season when the sources are scarce and the distances travelled to get water increases.

The variety of duties the women have to undertake compete with the water collection, both in time and most important with their energies. An estimate puts the percentage of energy from their food in take used on water collection as 15-27 percent. The carrying of water on top of the head put an extra strain on the head and can give pelvic disorders and problems associated there with.

The problem does not only lie with the quantity but also with the quality of water used. Water that is polluted is a dangers against health and life. Health is adversely effected, can disable and is the main cause of child death in Africa.

The scarcity of water in many African countries limit the activities of women and their productivity. Therefore the women should play a role in water projects as they are the ones who have to look for the water and manage the house.

The persons involved in the communities need to be clear about the involvement of water collectors, the beliefs, expectations and attitudes towards water, quantity and quality. Therefore the community need to be involved in the decisions before the planning of water projects take place.

In several other successful water supply and sanitation projects it has proven to be important that safe water supplies and sanitation must be both convenient and reliable. The water must be safe and the minimum quantity of water should be 20 - 40 litres per person per day to ensure that health benefits can occur.

It has been established that for drinking, cooking and food preparation 10 litres is the minimum requirement per day. Then secondly in priority is water for personal hygiene,

bathing and washing of eating utensils, for which 10 - 15 litres per day is the minimum. Then thirdly water should be available for washing clothes, etc.

The World Health Organisation has laid down a standard as guideline. For rural supplies one can say that the microbiological safety of the supply is the most important aspect. The quality standards set for rural supplies should be appropriate for the level of development, available resources, and the needs of the people. An improvement of water sources is then when the drinking water has improved over the previous available water source.

One cannot expect a person to change their habits just by telling everybody to change their habits. As women have got enough work to do, it is therefore important to get water as close as possible to the water collectors. Accessibility and convenience play a role in how much water people will use.

The biggest improvements take place when water is supplied in the house or yard. The consumption increases dramatically. So one can say water consumption tends to increase when water gets closer and therefore journey time decreases. Also when they do not have to stand in line and when the water source is closer than 1 km away the consumption could increase.

One has to state clearly that saving time and effort in water collection is important. In most communities collection of water is the responsibility of women. In certain places up to 10% of the family income is spent on delivery of water to the home. Showing how much they value the time they would have spent in collecting water.

It is important that women can save time in collecting water, they tend to do other household jobs that are likely to promote hygiene and can bring about health benefits.

The Water Cycle

There are enormous amounts of fresh water available in the world. Even while less then 1% of the total amount water is available for humans. There is 2,360,480 m^3 of fresh water available for each person in the world. The rainfall alone represents 23,486 m^3 per person annually over the world's land surface. The problem is the distribution. There were it is needed there does not seem to be enough. One can say it also different, namely humans have not settled there were there is enough water available. Agriculture is using 80% of the available fresh water. Rivers and lakes

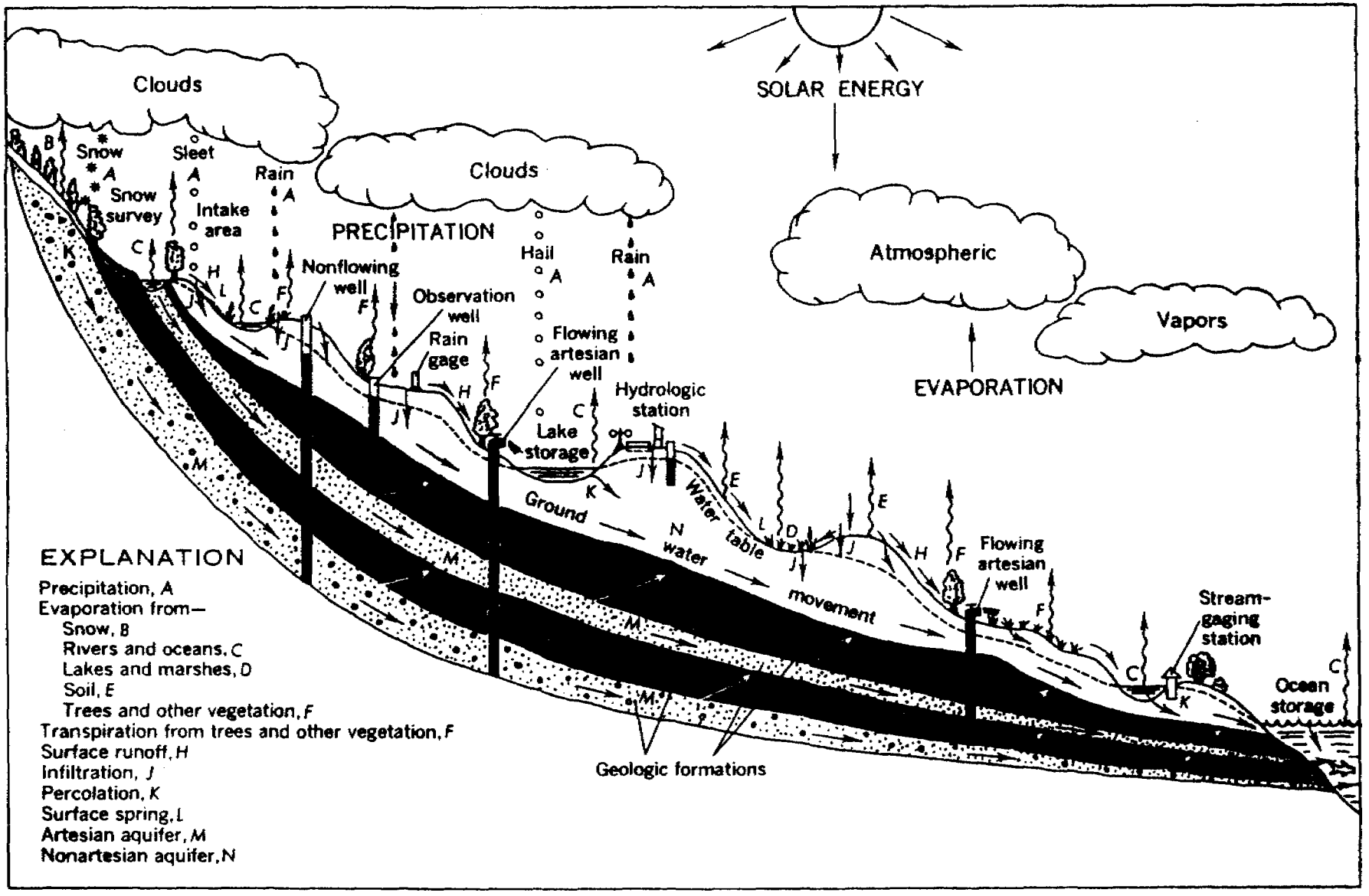
contain large amounts of fresh water.

There is a continuous cycle (the Hydrological Cycle, see figures on next page) on-going on the earth surface. Precipitation can consist of rain, snow, hail, mist and dew falling onto the earth's surface. It infiltrates into the ground and percolates through the ground to deeper layers or to springs or rivers or back into the ocean through underground layers. What cannot infiltrate and is not absorbed will run off into streams, rivers, lakes or dams/pans that are man made water reservoirs. Water from any surface will be turned to vapour by the heat of the sun and therefore evaporate into the atmosphere. Water taken up by plants and crops is also transpired into the atmosphere. The collective water vapour, evaporated by surface and transpired by plants then condenses into clouds and will fall to the earth again as rain under the right atmospheric conditions.

The water cycle can also be written as an equitation:

Precipitation - Evaporation -Transpiration = Run-off + Groundwater + Change in storage

Scientists make use of this equitation to determine the water resources of individual catchment areas or river basins, provided they have enough data collected over a long period. By making those calculations it can then be determined what can be taken from the system in a save way without disturbing the complete system and to prevent depletion of the groundwater.


Clouds
SOLAR ENERGY
Clouds
Snow
Sleet
Rain
Snow survey
Intake area
PRECIPITATION
Hail
Rain
Atmospheric
Vapors
Nonflowing well
Observation well
Rain gage
Flowing artesian well
Hydrologic station
EVAPORATION
Lake storage
Ground water
Water table
movement
Flowing artesian well
Stream-gaging station
Ocean storage
Geologic formations
EXPLANATION
Precipitation, A
Evaporation from—
Snow, B
Rivers and oceans, C
Lakes and marshes, D
Soil, E
Trees and other vegetation, F
Transpiration from trees and other vegetation, F
Surface runoff, H
Infiltration, J
Percolation, K
Surface spring, L
Artesian aquifer, M
Nonartesian aquifer, N

Drinking Water Quality

Normal persons assess the quality of drinking water by their senses. Water collects various kinds of impurities that change the colour, odour, taste and cloudiness of the water. This can happen when water infiltrates through the various layers of the earth but also as run-off it can collect all types of impurities laying on the ground as well as the soil itself. Depending on what impurities water collects it can stay dirty for a long time. The impurities can be organic, derived from decomposition of plants and animals and wastes, or inorganic such as soils, minerals and dissolved metals. From the soils it is clay that will stay longer in suspension then other type of impurity.

When water is being used as drinking water it should be colourless, odourless and pleasant of taste. Water having too much salt will taste not nice and water containing no salt, like rain water, will also not be liked by most people. Water should also be free from disease producing organism. Too many dissolved minerals will make the water appear "hard".

High levels of turbidity (cloudiness) can protect micro-organism from being killed and can stimulate growth of other bacteria. Sunlight in clear water will kill to an extend the bacteria in the top layer.

Water might be coloured by organic materials or certain metals also by colloidal parts as clay that happen to be the case in Bamba. Those particles will precipitate but it can take a long time.

Water odour is due mainly to the presence of organic substances. Some odours are indicative of increased biological activity. The combined perception of substances detected by the senses of taste and smell is often called "taste". "Taste" problems in drinking water supplies represent the largest single class of consumer complaints. Generally, the consumer is sensitive to inorganic compounds of metals.

Chemical characteristics of rural water are not normally harmful apart from excessive fluoride and nitrate levels. Excessive nitrate points normally to pollution problems from toilets and in certain agricultural areas of high nitrogen use on the fields. Iron in groundwater causes staining of clothes. If water is "hard" it can increase the time of cooking by 40%, leading to an increase in the use of fuel.

Microbiological Quality

Even if water is clear, odour free and taste good, that does not want to say that the water is safe to drink. Only one can say that especially when the water is cloudy the possibility of it being not safe is greater. Even water coming through a pipeline does not want to say that it is automatically safe. A burst in the pipe might have introduced some pathogens, also it can happen when the water is not properly treated that pathogens can freely multiply or being present.

Ideally, water should not contain any micro-organisms known to be pathogenic. It should also be free from bacteria indicative of excremental pollution. It is therefore normal that with piped water supplies a lab is attached to the water works as to be able to sample the water. Especially to ensure that the water is kept to the guidelines laid down by the WHO (see guidelines on the next page) or by the country itself. It is important that the water source is regularly examined for traces of faecal pollution. The primary bacterial indicator recommended for this purpose is the coliform group of organism as a whole. Although as a group they are not exclusively of faecal origin, they are universally present in large numbers in the faeces of man and warm blooded animals, and thus can be detected even after considerable dilution.

In unpiped water supplies, the bacteriological objective is to reduce the coliform count (statistically determined as the most probable number of a certain bacteria) to less than 10 per 100 ml and to ensure the absence of faecal contamination.

To make water cleaner and more or less safe one can use a water filter as described on the next pages. It will not give immediately safe water, this might take several days. A filter needs regular maintenance like everything that gets used every day.

Guidelines by the WHO

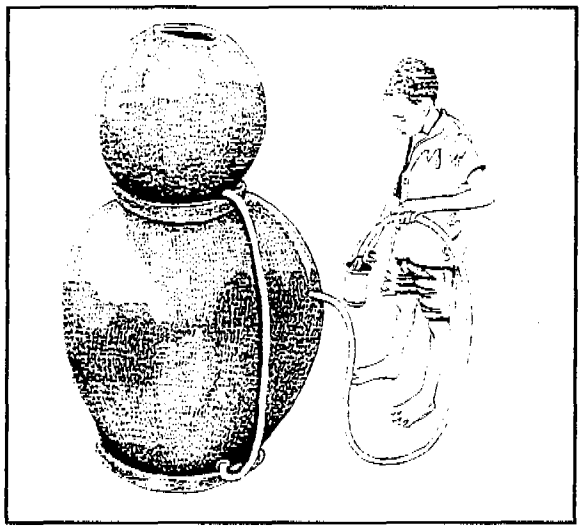
Organisms	Units	Guide-line value	Remarks
A) Piped Water supplies **A1) Treates water entering the distribution system**			
faecal coliforms	number/100 ml	0	turidity < 1 NTU; pH < 8
faecal organisms	number/100 ml	0	
A2) Untreated water entering the distribution system			
feacal coliforms	number/100 ml	0	
coliform organisms	number/100 ml	3	* = in an occasional sample but not in consecutive samples
A3) Water in the distribution system			
feacal coliforms	number/100 ml	0	
coliform organisms	number/100 ml	3	*
B) Unpiped water supplies			
faecal coliforms	number/100 ml	0	
coliform organisms	number/100 ml	10	should not occur repeatedly

Constituent or characteristic	Unit	Guideline Value	Remarks
aluminium	mg/l	0.2	
chloride	mg/l	250	
colour	true colour units (TCU)	15	
copper	mg/l	1.0	
detergents		none	no foaming or taste or odour prolem
hardness	mg/l (as $CaCO_3$)	500	
hydrogen sulfide			not detectable by consumers
iron	mg/l	0.3	
maganese	mg/l	0.1	
pH		6.5 - 8.5	
sodium	mg/l	200	
solids - total	mg/l	1000	dissolved solids
sulfate	mg/l	400	
taste and odour			inoffensive to most consumers
turbidity	nephelometric turbidity units (NTU)	5	preferably <1 for disinfection efficiency
zinc	mg/l	5.0	

UNICEF's UPWARD-FLOW FILTER

A water filter that can provide clean water for about 10 persons.

The upward flow filter can remove particles or organic material from water. The filter can easily be constructed and operated under rural situations. Depending on the water source used the filter can work for one year.



Components: Storage tank, filter tank, 3 pieces of 1/2" GI pipe and non clear plastic tubing, like a water hose.

System works: Storage tank (top) is used to put the collected water in. One piece of GI pipe is at bottom of the storage tank, and one piece of GI pipe is at the bottom of the filter tank which are connected by the hose pipe. The plastic should not be clear otherwise formation of algae in tubes will occur. The water in the storage tank will push the water through the filter media in the filter tank.

Construction of the Tank:

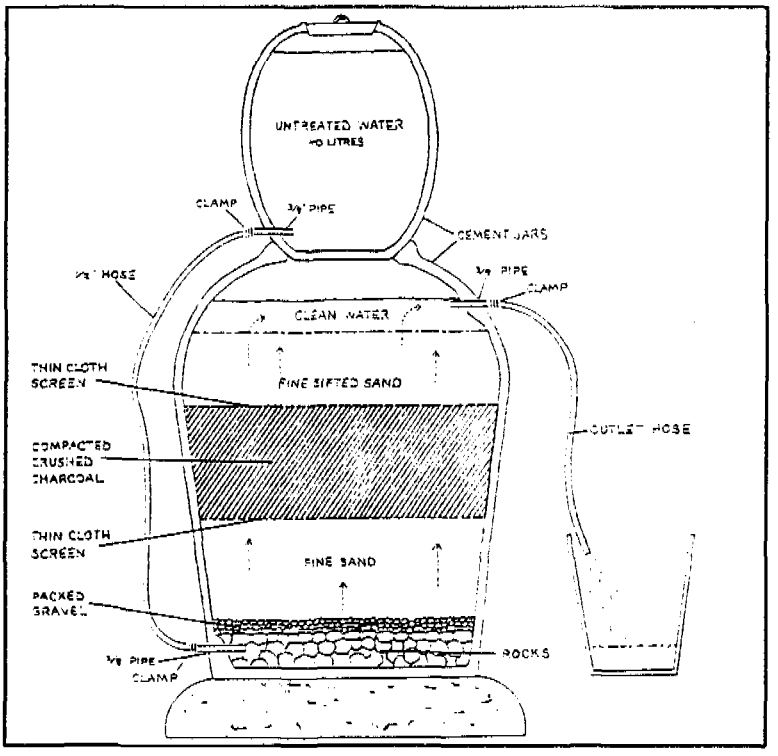
Cement jars can be made with a bag of wood shavings, some chicken wire, sand and cement. The base of the filter jar need to be strengthened as the filter media is heavier then water.

The tanks could be constructed by an experienced fundi without to many problems. The top of the filter jar should be made such that the top jar fits on it tightly so nothing can pollute the filtered water.

Filter Media:

At the bottom of the filter jar one needs some stones with a diameter of 5 cm to keep the inlet pipe from getting blocked. The sufficient gravel to form a 5 cm layer is required. The stones and the gravel need to be properly cleaned before being used.

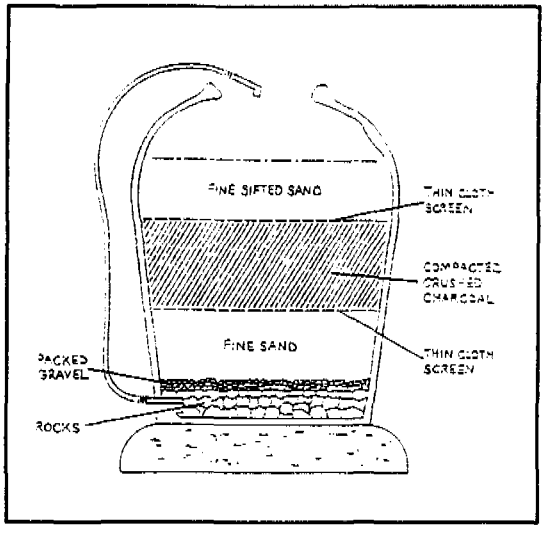
The sand at the bottom is preferably made from clean, unsifted river sand. The layer should be 20 - 25 cm deep. Also this material need to be properly cleaned and dried in the sun.



Charcoal to be used as the layer between the two layers of sand is ordinary charcoal. The charcoal must be pulverized into very small chips of grains about 5 mm in diameter, enough need to be made to make a layer of 25 - 30 cm, when tightly compacted. Make sure that the dust is removed, one does that by immersing the grains in a bucket with water.

The sand at the top should be also of clean, sifted sand. The screen to filter the sand should be mosquito mesh. Clean and dry sand before use.

Filter Beds :



Stones to be placed around inlet to prevent blockage. Gravel place to form a bed of 5 cm deep so that water can spread over the total bottom.

It is advisable that after placement of each layer one pours some water through the bottom to see if it works properly.

On top of gravel the sand is placed, 20 - 25 cm deep. Cover the sand layer with a sheet of fine gauze. Charcoal is placed on top of the cloth and needs to be well compacted before layer the nest layer of charcoal on top

before laying the last layer of sand. Do not forget to test every time.

Operation of the Water Filter :

If the beds are laid properly then all the layers should already be immersed. Once the filter is functioning then the beds should be kept immersed as that will ensure that the bacteria which develop on the charcoal will be kept alive. The bacteria are essential to remove disease carrying micro-organisms from the water.

To make the filter start one pours the same water through the filter for 20 times. As with everything in live a certain amount of looking after is required so that the filter works properly and keeps working properly.

Replacement of the filter material will the required if the effect of cleaning the top layer and replacement of it has not any longer the expected good filtration as effect.

WATER COLLECTION AND EXTRACTION

Water can be collected and or extracted in several ways. We will just mention the ones that are in use in the project area, namely roof water catchment, pans and piped water.

Roof water catchment and pans are depending on rain only. The Giriama dam is depending on rain and the river. The piped water in Kilifi District comes from the Sabaki River works mainly. The Sabaki river has various sources like springs and from ground water during the dry season as well as run-off during the rainy season. All systems depend on the rain pattern of the catchment areas.

For the roof catchment it depends on the plan of the house, the pan depends on the catchment area that will flow in the pan. The Sabaki river has a very big catchment area going all the way back to Nairobi. So some water is being extracted and lost, but replenishment takes place.

Roof Water Catchment

A rainwater collection system consists out of some essential items and a few extra items that can improve the system. The most important is the roof that should have corrugated iron sheets or cement-fibre roof tiles. The house should be preferably permanent or semi-permanent. The next items are the gutters and the downpipes. The tank is the item in which the water is being kept. A way to divert the first water and a sand catchment will improve the quality of water flowing into the tank.

The capacity of the tank should be a function of the plan of the roof and the quantity of rain falling during the year. The water drawn from the tank will depend on the amount of persons in the household and the quantity of water used by each.

Pans

Water is collected from the soil surface and led in a man made or improved natural depression. The quantity of water that can be saved in the pan will depend on the size of the pan, the size of the catchment and the rainfall.

The quality of the water collected in the pan is depending on how well the

catchment area is kept. Once the water is in the pan then it needs to be kept in such ways that cattle and persons do not wade into the water. The collection of water need to be regulated as well, so that as less as possible dirt comes into the pan or being stirred up. Polluted water can get worse polluted by careless use.

Piped Water

Piped water comes from the water works, which get the water from the Sabaki river that need removal of the silt load. Treatment of river water will depend on the silt load of the river. After the removal of the silt the water is chlorinated to kill the pathogens in the water. The cleaner the water after the treatment works the more effective the chlorination will be. Whatever the case the water coming from a good working water works will be safe.

Most people will only know the water coming from a tap or public standposts and will not be interested were it comes from. A well-designed standpost must:

- Provide sufficient quantities of water to all users when it is needed
- Be durable and reflect local customs
- Contribute towards improvements in public health

Water & Excreta Related Infections

Health, Water & Sanitation

The World Health Organization estimates:

* 25 million people die each year from water - & excreta-related diseases (ie from inadequate water supplies & lack of adequate sanitation)
* This includes some 5.5 million children under 5 who die each year from diarrhoeal disease alone
* 80% of all morbidity (sickness) due to water- and excreta- related disease

Why do people die young in developing countries?

* Insufficient food
* what food there is generally contaminated by excreta
* excreta- & water-related parasitic diseases
* respiratory diseases
* i.e. because of POVERTY (absolute and relative terms)

Annual deaths of children under 5 by cause, 1986.

Cause	No of deaths (millions)	Percentage of deaths
Diarrhoea	5.0	35.9
Measles	2.1	14.9
Neonatal tetanus	0.8	5.7
Pertussis (Whooping cough)	0.6	4.3
Other ARI(*)	1.3	9.2
Malaria	3.0	21.3
Other	1.3	9.3

(*) Other acute respiratory infections: eg TB, diphtheria, pneumonia, influenza, pleurisy, bronchitis, otitis media.

WATER - RELATED DISEASES

ENVIRONMENTAL CLASSIFICATION OF WATER-RELATED DISEASES

I. WATERBORNE diseases

* caused by pathogens present in drinking water
* source of pathogens: excreta, sewage
* examples of diseases which can be waterborne:
  - o typhoid, cholera, enteroviral diseases
* transmission route:
  excreta ----> water ----> mouth
* infective dose (depending on person his health state)
  - o bacterial diseases: high (> 10000)
  - o protozoal and viral diseases: low (< 100)

II WATERWASHED diseases

* caused by lack of adequate volumes of water for personal and domestic hygiene
* for example:
  - o trachoma, scabies and other skin and eye infections
  - o typhoid, cholera, shigellosis, enteroviral diseases, giardiasis i.e. all the "waterborne" diseases
  - o ascariasis, enterobiasis
* non-communicable water-washed diseases:
  for example, cancer of the penis and cancer of the cervix

WATERBORNE (water quality) OR WATER-WASHED (water quantity)

In low-income communities water-washed diseases are likely to be more important than waterborne diseases.

Why? Because the transmission route is basically the same:

from the anus of one person

to the mouth of another

i.e. both waterborne and waterwashed diseases are FAECO-ORAL infections.

Possible routes:

1. faeces of A ---➤ fingers of A ----➤ mouth of B
2. faeces of A ---➤ fingers of A ----➤ fingers of B -----➤ mouth of B
3. faeces of A ---➤ fingers of A ----➤ food -➤ mouths of B,C
4. faeces of A ---➤ water ----➤ mouths of B, C ....

1 - 3 are water-washed routes, 4 is waterborne

Under conditions of water scarcity the water-washed routes are most likely and the waterborne route least likely (but none the less possible - for example, a shallow well too close to a pit latrine)

WHICH WATER SUPPLY IMPROVEMENT IS LIKELY TO HAVE A GREATER IMPACT ON HEALTH -

improve water QUALITY

or

improve water QUANTITY ?

* If "waterborne" diseases are actually more commonly water-washed (and they almost always are), then improvements in water quantity will have a greater health impact and so be more cost-effective than improvements in water quality
* So in poor rural areas water treatment (ie improvement in water quality) may NOT be a good investment

III WATER-BASED diseases

* these are all helminthic (worm) diseases
* the pathogen spends part of its life cycle in one or more intermediate aquatic hosts (the first, or only, of which is an aquatic snail, in which massive asexual multiplication takes place)
* for example, schistosomiasis (also called bilharzia):
  man (faeces or urine) ---➤ water ----➤ snail ---➤ water ---➤ man
  250 million people infected in developing countries
  Single dose of Praziquantel, 40 mg/kg body weight.

IV WATER-RELATED INSECT VECTOR diseases

* Vector breeds in water

  for example : malaria, filariasis (elephantiasis)

* Vector bites near water

  for example: sleeping sickness

and some vectors do both, for example: river blindness

SUMMARY

Environmental classification of Water-Related Diseases

I Feaco-oral diseases

1. high infective dose eg typhoid
2. low infective dose eg viral diseases

II Water-washed, non-faeco-oral, diseases

1. eye infections trachoma
2. skin infections scabies

III Water-based diseases

1. percutaneous schistosomiasis
2. ingested clonorchiasis

IV Water-related insect vector diseases

1. biting in water trypanosomiasis
2. breeding in water malaria

PREVENTATIVE STRATEGIES FOR THE CONTROL OF WATER-RELATED DISEASES

Environmental transmission mechanism	Preventative strategies
Waterborne	o improve water quality o prevent use of unimproved sources
Water-washed	o improve water quantity o improve its accessibility o improve hygiene
Water-based	o decrease need for water contact o control snails o improve quality
Water-related insect vectors	o destroy breading sites o decrease need to visit breeding sites o improve surface water management

AIMS and BENEFITS of water supply improvements

Immediate aims

- o improve water quality
  - quantity
  - availability
  - reliability

Stage I benefits

- o save time and energy expended in water collection
- o improved health ???? (education etc)

Stage II benefits

- o labour release
- o crop innovation and improvement ???
- o animal husbandry innovation and improvement ???
- o improved health ???

Stage III benefits (long term)

- o higher cash incomes
- o increased food
- o increased health
- o increased leisure

COMPLEMENTARY INPUTS needed to achieve these aims and benefits

Aim or benefit	Complementary input or prerequisite conditions
Immediate aims	Active community participation and support Adequate facilities for operation & maintenance Appropriate technology used
Stage I Benefits	New supply used in preference to old New supply closer than old Water use pattern changed to take advantage of improved availability, reliability and quantity Excreta management (improved sanitation) Supply must not create new health hazards (e.g. mosquito breeding)
Stage II Benefits	Good extension services in agriculture; cooperatives' credit; marketing; education
Stage III Benefits	Water supply development must be part of integrated rural development

EXCRETED INFECTIONS

Pathogens in excreta of one person causing disease in another

Pathogens in excreta ------ wide variety of

VIRUSES

BACTERIA

PROTOZOA

HELMINTHS

Successful transmission of an excreted infection depends on:

1.Number of pathogens excreted = **"excreted load"**

2.How long it takes for excreted pathogens to become infective = **"latency"**

3.How long pathogen can survive in the extra-intestinal environment = **"persistence"**

4.Whether pathogen can multiply in the extra-intestinal environment = **"multiplication"**

5.Number of pathogens required to cause infection = **"infective dose"**

Environmental Classification of Excreta-related Infections

Category	Infection	Pathogenic Agent	Dominant transmission mechanisms	Major control measures (engineering measures in italics)
I Faecal-oral (non-bacterial) Non-latent, low infectious dose	Poliomyelitis	V	Person to person contact Domestic contamination	*Domestic water supply* *Improved housing* *Provision of toilets* Health education
	Hepatitis A	V		
	Rotavirus diarrhoea	V		
	Amoebic dysentery	P		
	Giardiasis	P		
	Balantidiasis	P		
	Enterobiasis	H		
	Hymenolepiasis	H		
II Faecal-oral (bacterial) Non-latent, medium or high infectious dose, moderately persistent and able to multiply	Diarrhoeas and dysenteries		Person to person contact Domestic contamination Water contamination Crop contamination	*Domestic water supply* *Improved housing* *Provision of toilets* *Excreta treatment prior to re-use or discharge* Health education
	Campylobacter enteritis	B		
	Cholera			
	E.coli diarrhoeas	B		
	Salmonellosis	B		
	Shigellosis	B		
	Yersiniosis	B		
	Enteric fevers	B		
	Typhoid			
	Paratyphoid	B		
		B		
III Soil-transmitted helminths Latent and persistent with no intermediate host	Ascariasis	H	Yard contamination Ground contamination in communal defaecation area Crop contamination	*Provision of toilets with clean floors* *Excreta treatment prior to land application*
	Trichuriasis	H		
	Hookworm	H		
	Strongyloidiasis	H		
IV Beef and Pork tapeworms Latent and persistent with cow or pig intermediate host	Taeniasis	H	Yard contamination Field contamination Fodder contamination	*Provision of toilets* *Excreta treatment prior to land application* Cooking and meat inspection
V Water-based helminths Latent and persistent with aquatic intermediate host(s)	Schistomiasis	H	Water Contamination	*Provision of toilets* *Excreta treatment prior to discharge* *Control of animals harbouring infection* Cooking
	Clonorchiasis	H		
	Diphyllobothriasis	H		
	Fasciolopsiasis	H		
	Paragonimiasis	H		
VI Excreta-related insect vectors	Filariasis (transmitted by Culex pipiens mosquitoes)	H	Insects breed in various faecally contaminated sites	*Identification and elimination of potential breeding sites* Use of mosquito netting
	Infections in Categories I - V, especially I and II, which may be transmitted by flies and cockroaches	M		

B = Bacterium H = Helminth P = Protozoon V = Virus
M = Miscellaneous

HEALTH IMPACT OF SANITATION IMPROVEMENTS

Disease category from Table (* = see below)		Impact of sanitation alone	Impact of personal hygiene alone
I	Non-bacterial faecal-oral	Negligible	Great
II	Bacterial faecal-oral	Slight to Moderate	Moderate
III	Soil-transmitted *helminths*	Great	Negligible
IV	Beef and pork tapeworms	Great	Negligible
V	Water-based helminths	Moderate	Negligible
VI	Insect vector	Slight to Moderate	Negligible

* = Table: Environmental Classification of Excreta-related Infections

CATEGORIES 1 - II **Mainly water**

CATEGORIES III - V **Mainly sanitation**

COMPLIMENTARY INPUTS

*	**improved water supplies**	**I, II, III & V**
*	**treatment to kill/remove pathogens**	**II, III, IV & V**
*	**cooking of meat/fish/aquatic vegetation**	**IV & V**
*	**insect control**	**VI**
*	**HEALTH EDUCATION**	**All categories**

CONCLUSION

The major health impact is achieved not by multiple-tap in-house water supplies and conventional sewerage, but by increasing water consumption to around 30 litres/person/day and by providing a suitable toilet which people of all ages will use properly and maintain regularly, so that incidence of water-related (especially water-washed) disease and transmission of excreta-related diseases are substantially reduced.

PERSONAL HYGIENE

Introduction

WATERWASHED diseases are caused by lack of adequate volumes of water for personal and household hygiene. Water-washed diseases can affect the skin and eyes, the first part considers the effects of both hygiene practices and the availability of water on skin and eye disease and then basic guidelines of cleanliness follows.
In tropical and subtropical developing countries skin and eye diseases are common reasons for visiting a health clinic. Reduced occurrence would, therefore, be beneficial to patients and staff.

EYE DISEASE

Two-thirds of the 28 million blind people in the world live in the developing countries, where blindness rates can be 10-20 times the rates in developed countries. People and particularly children under five years old living in a poor environment, with inadequate housing, sanitary facilities, food intake and health care are most at risk. By improving services and hygiene practices in these areas, up to 80% of blindness could be prevented.

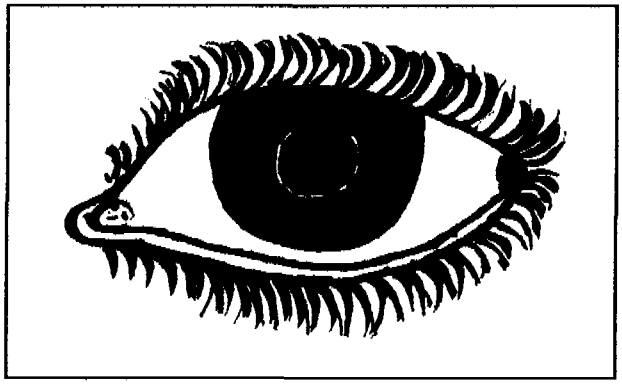
The eye has its own protective mechanisms, some of which are shown in Figure 1. These are weakened by illness, poor diet, hygiene and chemical or physical damage.

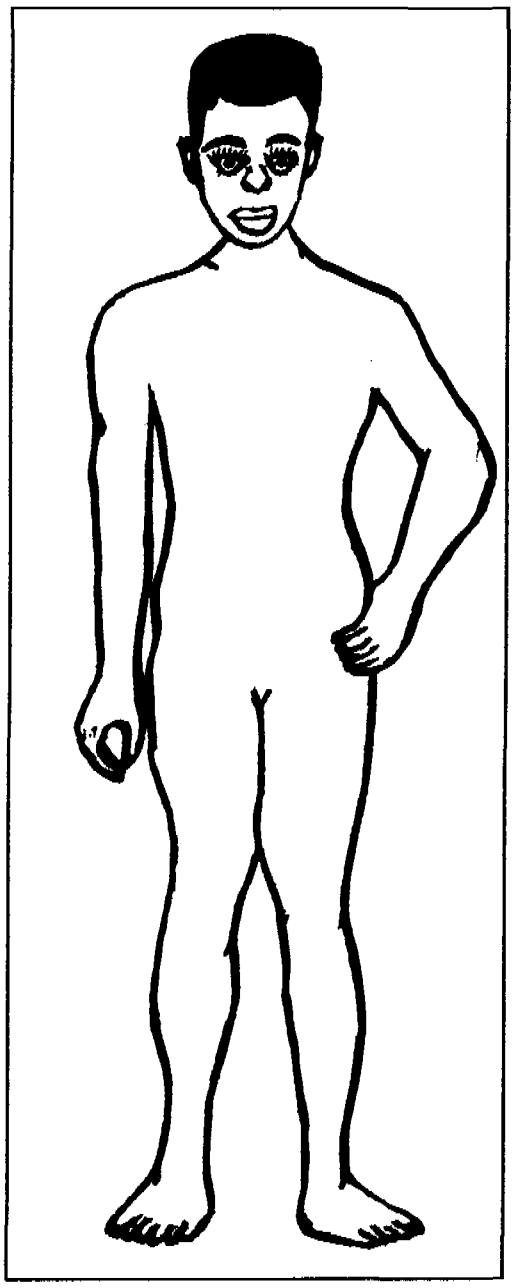
Conjunctivitis and trachoma, common water-washed eye diseases, are transmitted by dirty hands and towels and sometimes by flies. Trachoma affects over 500 million people, blinding seven to nine million of them through scarring of the conjunctiva, distortion of the eyelids and opacification of the cornea.

Eyelashes - keep out sweat, rain and strong light.

Eyelids - blink/close to keep out dust, light and danger (insects, solid objects etc)

Tear gland - produce fluid in a reflex response to irritation and evaaporation. The fluid contains lysozyme - a baterial killing fluid





Hair - dirt gets attached to greasy hair, combs and brushes. Wash hair, combs and brushes; lice need to be checked and to be treated.

Eyes - wash around the eyes to avoid excess mucus, do not rub the eyes especially not with dirty hands or cloth.

Nose - greasy outer skin can collect dirt and blocking of pores.

Armpits - sweat is formed and collect here, bacteria will grow there, seat smells and pathogens can grow there.

Skin - Soap or ash should be used to clean the skin to keep the pores open, remove sweat, dead cells and grease. Open pores are essential for skin functions.

Hands - the hands handle all items and one can spread pathogens etc from other parts of the body to mouth and eyes. Hands need to be kept clean and especially before eating anything, after going to the toilet and after dealing with animals and anything else.

Nails - clean under the nails as there organism can multiply or stay dormant, trim and keep clean.

Fingers and toes - in between sweat collects and soften the skin and fungal growth can start, wash and dry well to discourage any growth of fungi.

Feet - when walking bare footed it is possible to pick up worms as well as other pathogens.

SKIN DISEASE

Skin provides an almost continuous, waterproof and protective barrier to harmful agents, chemical and pathogenic. It assists in the control of body temperature, moisture content and waste disposal but also gives food, protection, warmth and moisture to many micro-organisms and larger parasites such as fleas and lice. Even clean, healthy skin has around five millions bacteria per square centimetre, that is about 100,000,000,000 bacteria on an adult. Most of these bacteria are not harmful. In fact they may help to keep the skin clear of dead cells, sweat and, by producing acids and other chemicals, fungi. Yet, if hygiene is poor and the skin is broken or punctured (cuts, insect bites etc.), harmful agents that come into contact with it can cause disease. Resistance is reduced further by illness, malnutrition or stress.

CONTROL OF WATER-WASHED DISEASES

It is generally accepted that at least 30 litres of water per person per day is necessary for adequate personal and domestic hygiene. Even at rates greater than this, education on the benefits of hygiene practices may be needed to reduce water-washed disease. To reach this level of water availability and use, measures in the following list should be considered:

- reduce distances to water sources to less than 250 metres
- improve or increase ground and surface water sources
- supplement sources with domestic rainwater harvesting
- reduce losses by good operation and maintenance
- build washing slabs and showers
- provide soap, especially in schools
- provide hygiene education in schools, clinics, community centres
- initiate environmental improvement projects, including housing

To reduce the incidence of water-washed diseases good personal hygiene practices are vital. Some of the problem areas and solutions are illustrated in the illustration.

Using natural fibres, such as wool and cotton in clothes and bedding is better than using man-made fibres, such as nylon and polyesters, as they allow the skin to breathe and sweat to evaporate. Care must be taken to avoid transmission from clothes to skin of eggs laid by bot flies, such as the tumbu fly (Cordylobia anthropopaga). The eggs hatch and the larvae penetrate the skin producing large painful lesions from which the mature larvae emerge and fall to the ground. Sepsis often occurs at these exit sites. The practice of drying clothes on the ground increases transmission; ironing clothes kills the eggs.

Transmission of water-washed disease is decreased if houses and surrounding areas are kept clean and if bodies, hair, clothing and bedding are washed frequently.

BASIC GUIDELINES OF CLEANLINESS

Personal Cleanliness (Hygiene)

1. Always wash your hands with soap when you get up in the morning, after having bowel movement, and before eating.

2. Bathe often - every day when the weather is hot. Bathe after working hard or sweating. Frequent bathing helps prevent skin infections, pimples, itching, and rashes. Sick persons, including babies, should be bathed daily.

3. In areas were hookworm is common, do not go bear foot or allow children to do so. Hookworm infection causes severe anaemia. These worms enter the body through the soles of the feet.

4. Brush your teeth every day and after each time you eat sweets. If you do not have a toothbrush and toothpaste, rub your teeth with salt and baking soda.

Cleanliness in the Home

1. Do not let goats or pigs or other animals come into the house or places where children play.

2. Do not let dogs lick children or climb up on beds. Dogs, too, can spread disease.

3. If children or animals have a bowel movement near the house, clean it up at once. Teach them to use a latrine or at least to go farther from the house.

4. Hang or spread sheets and blankets in the sun often. If there are bedbugs or scabies, pour boiling water on the cots and wash the sheets and blankets - all on the same day.

5. De-louse the whole family often. Lice and fleas carry many diseases. Dogs and other animals that carry fleas should not come in the house.

6. Do not spit on the floor. Spit can spread disease. When you cough or sneeze, cover your mouth with your hand or a cloth or handkerchief.

7. Clean house often. Sweep and wash the floors, walls, and beneath furniture. Fill in cracks and holes in the floor or walls where roaches, bedbugs, and scorpions can hide.

Cleanliness in Eating and Drinking

1. Ideally all water that does not come from a pure water system should be boiled before drinking. This is especially important for small children and at times when there is a lot of diarrhoea or cases of typhoid, hepatitis, or cholera. Water from holes or rivers, even when it looks clean, may spread disease if it is not boiled before use.

2. Do not let flies and other insects land or crawl of food. These insects carry germs and spread disease. Do not leave food scrapes or dirty dishes lying around, as these attract flies and bread germs. Protect food by keeping it covered or in boxes or cabinets with wire screens.

3. Before eating fruits that has fallen to the ground, wash it well. Do not let children pick up and eat food that has been dropped - wash it first.

4. Only eat meat that is well cooked. Be careful that roasted meat, especially pork, does not have raw parts inside. Raw pork carries dangerous diseases.

5. Do not eat food that is old or smells bad. It may be poisonous. Do not eat the canned food if the can is swollen or squirts when opened. Be especially careful with canned fish.

6. People with tuberculosis, flu, colds, or other infectious diseases should eat separately from others. Plates and utensils used by sick people should be boiled before being used by others.

How to Protect your Children's Health

1. A sick child should sleep apart from children who are well. Sick children or children with sores, itchy skin, or lice should always sleep separately from those who are well. Children with infectious diseases like whooping cough, measles, or the common cold should sleep in separate rooms, if possible, and should not be allowed near babies or small children.

2. Protect children from tuberculosis. People with long-term coughing or other signs of tuberculosis should cover their mouths whenever they cough. They should never sleep in the same room with children. They should see a health worker and be treated as soon as possible.
Children living with a person who has tuberculosis should be vaccinated against TB (B.C.G. Vaccine).

3. Bathe children, change their clothes, and cut their fingernails often. Germs and worm eggs often hide beneath long fingernails.

4. Treat children who have infectious diseases as soon as possible, so that the diseases are not spread to others.

5. Follow all the guidelines of cleanliness mentioned. Teach children to follow these guidelines and explain why they are important. Encourage children to help with projects that make the home or village a healthier place to live.

6. **Be sure children get enough good food.** Good nutrition helps protect the body against many infections. A well-nourished child will usually resist or fight off infections that can kill a poorly nourished child.

Public Cleanliness (Sanitation)

1. Keep wells and public water holes clean. Do not let animals go near where people get drinking water. If necessary, put a fence around the place to keep animals out.
   Do not defecate or throw garbage near the water hole. Take special care to keep rivers and streams clean upstream from any place where drinking water is taken.

2. Burn all garbage that can be burned. Garbage that cannot be burned should be buried in a special pit or place far away from houses and the places where people get drinking water.

3. Build latrines so goats and other animals cannot reach the human waste.

Use of latrines helps prevent many sicknesses.

Home Hygiene

The elements of Home Hygiene include water-, environment-, domestic- and food hygiene. It also includes housing and homestead planning.

1. Hygiene of Water

a). **At the source**:

- build a fence
- build a drainage facility (rocks, cement apron, pipe) and keep it clean
- Cover the well or spring
- Keep foreign matter out of the source
- Set up a water lifting device (pulley or other system to keep buckets out of the mud).
- Organize a monitoring system (a person, committee, teachers or others guarding the source to keep animals away/avoid waste/ ensure proper behaviour around the source).

b) **During Transportation**:

- Use clean containers
- Keep foreign matter out of the containers

c) **During storage**:

- Use clean containers
- Keep foreign matter out of the containers
- Use clean dippers
- Cover the containers

2. Hygiene of the Environment in the Community

a) **Latrines**:

- Should be at least 30 metres from a water source and 6 metres from any house
- Should be properly constructed (at least 2 metres deep)
- Make sure they are covered
- Make sure they are kept clean

b) **Garbage**:

- Dig ditches or pits for garbage disposal
- Organise garbage pick up/disposal

c) **Stagnant water**:

- Fill in places where water stands
- Drain off (away) stagnant water

3. Individual and Domestic Hygiene

a) **Latrines**:

- Make sure people have and use latrines
- Make sure people know how to cover then keep them clean and they do it.
- Make sure children's faeces are properly disposed of.
- Should be at least 30 metre from a water source
- Should be at least 6 metre away from any house
- Should be properly constructed (at least two metre deep)

b) **Waste water disposal**:

- Construct proper drainage for bathing, dish and clothes washing and cooking areas (soakage pits, drainage ditches).

c) **Use of water**:

- Drinking plenty of water
- Washing hands before eating, cooking and after defecating, working or handling dirty things
- Taking fragment baths or showers
- Washing clothes after and thoroughly
- Washing dishes and cooking utensils after every use

d) ***Avoiding standing water***:

- Keeping cans and other containers from accidentally collecting water by safety disposing them of
- Filling in holes and ditches that collect water

e) **Garbage Disposal**:

- fragment disposal in community or village or homestead dumping area (site)
- Digging ditches (pits) and covering garbage

4. <u>Food Hygiene</u>

a) **Food stores**:

- To be well designed and constructed
- To be rat proofed
- To be well lit and ventilated
- to be free from insect infestation

b) **Food preparation**

- To be prepared in sanitary premises (houses)
- Preparation tables to be of sound material
- Cooking utensils to be of sound material and design
- Cooks not to be suffering from any communicable disease likely to be transmitted through food

c) **Prepared/Cooked food**:

- To be eaten while still hot
- To be kept in well ventilated fly-proofed cupboards
- Left-overs not to be eaten until after it has been rewarmed or heated

5 Housing

a) **Structures**:

- To be constructed of sound materials
- To be of good design (economy, health and convenience)

b) **Lighting and ventilation**:

- Adequate windows (in size, number and locations)
- Total square area to be at least 10% of the total square area of the floor of the room to be served.

c) **Floors**:

- To be hardened and brought to a smooth finish

d) **Animals**:

- Not to be shared with animals (sleeping purposes)

6. Homestead planning

a) **Latrines**:

- to be stored in accordance with maximum convenience to all family/homestead members
- Consider the factors such as topography, direction of wind, distance from nearest water source or house, homestead entrance (gate), etc. in its siting
- Number to be determined by family size and cultural beliefs/taboos.

b) **Cattle boma**:

- To be sited fairly far away from the residential houses
- Preferably to be at the rear end of the homestead
- Cattle manure heaps to be regularly turned to avoid fly breeding

c) **Houses**:

- To be sited in accordance with one's cultural or religious beliefs, but to be at least 6 metres away from the nearest latrine.

d) **Kitchen Garden**:

- to be sited next to the kitchen and/or next to the cattle manure heap for soil conditioning

e) **Water Source**:

- to be at least 30 metres away from the nearest latrine.

TRANSMISSION OF COMMUNICABLE DISEASES

To become sick a number of factors have to come together. This paper describes point wise all the elements needed to become sick. The factors are deliberately taken point after point. The borders between one and the other can be faint but are intentionally made in order to be able to discuss all the factors exhaustively.

Six factors, ALL of which must be present:

1.	A Causative Agent (Germ Causing disease)
2.	A reservoir or source of the Causative Agent (Source of Infection)
3.	A mode of escape from reservoir (Route of Escape)
4.	A mode of transmission from reservoir to new host (Route of Transmission)
5.	A mode of entry into the new host (Route of Entry)
6.	A susceptible host (Person without Immunity)

Causative - acting as a cause

1. Examples of various <u>Causative Agent(s)</u> classified in various groups:

1.1 Animal Parasites

(a) Protozoa (amoeba, plasmodia)
(b) Worms (Hook/tape worms, blood/liver flukes)

1.2 Bacteria; classical waterborne diseases, Tetanus (Clostridium tetanus), plague (Yersimia pestis), Tubercolosis (Mycobacterium tuberculosis & Africanum)

1.3 Viruses (smallpox, yellow fever, common cold)

1.4 Rickettsiae (relapsing fevers)

1.5 Plant Parasites (athlete's foot, ring worm)

"Infection is the invasion of the host by some other form of life by growth and multiplication of the invading organism within the body of the host."

"Infection is the invassion of the living body (host) by a disease causing agent e.g. bacteria, etc. which establishes itself by growth and multiplication within the hosts's body."

Mode of action by the various organism can be categorized in:
Direct invasion (doing direct damage)
Toxin production (doing its damage through toxic production)

2. There are various <u>Reservoirs of Infection</u> namely:

2.1 Soil, which we are in contact with all the time.
(Reservoir for fungi, Causative Agent's of tetanus, anthrax)

2.2 Animals, a large variety of animals can carry diseases.
(domestic animals, rodents, arthropods, wild birds; usually the disease is not a human disease - e.g. brucellosis and anthrax; human-to-human spread is rare, except bubonic plague)

2.3 Man, man is the main carrier of his own diseases.
[Clinical cases (clear case of a disease), subclinical cases (not obviously ill but can spread the disease), and CARRIERS (do not suffer at all but source of spreading the diseases) - convalescent, chronic and transient carriers]

3. Ways of <u>Escape from Reservoir :</u>

3.1 Respiratory tract (+ mouth); droplet nuclei; continues emission)

3.2 Intestinal tract: discharge of faeces; discontinuous emission
Vomit

3.3 Urinary tract (less problematic)

3.4 Open wounds (escape from lesions on to clothes, bed linen)

3.5 Mechanical escape (biting or sucking insect; e.g. malaria spread by mosquitoes, flea with plague)

4. Transfer of Infection to New Host

4.1 Direct transmission (person to person)

4.2 Indirect transmission (requires a VEHICLE)
Classification of vehicles

4.2.1 ANIMATE vehicle, referred to as VECTORS, e.g. housefly, flea, mosquito, rat, flea

4.2.2 INANIMATE vehicle: Water, Milk, Food, Air, Soil and Fomites, e.g. clothes, doorknobs, money etc.

5. Entry into New Host

Portals of entry are:

5.1 Respiratory tract, inhalation of droplet nuclei (Inhalation)

5.2 Gastrointestinal tract; contaminated food or drink (Oral route)

5.3 Direct infection of membranes (e.g. diphtheria, venereal diseases) (contact)

5.4 Percutaneous infection (passage through the skin); via bite for rabies and malaria; direct penetration by Causative Agent e.g. schistosomiasis, hookworm. (skin)

6. Host Susceptibility

6.1 Disease follows only if host is susceptible
Several diseases one cannot avoid when coming in direct contact with them.

6.1.1 Immunity = impossibility of contacting disease

6.1.2 Resistance = varying degrees of protection

Forces of Infection | HUMAN BODY | Resistance of Host

6.2 Resistance depends on

6.2.1 General health; diet

6.2.2 Possession of antibodies (previous attack or inoculation)

7. CONTROL OF INFECTIOUS DISEASE

Prevention is cheaper than cure.

Achieved by:

7.1 Increasing resistance by host (by inoculation, improved diet)

7.2 Minimizing ill effects of cases not prevented (quarantine, good hospitals and health clinics)

8. Preventing Spread of Disease

8.1 Increasing resistance by host (by inoculation, improved diet)

8.2 Minimizing ill effects of cases not prevented (quarantine, good hospitals and health clinics)

8.3 Reservoir eradication - slaughter of infected animals and chemotherapy

8.4 ENVIRONMENTAL SANITATION

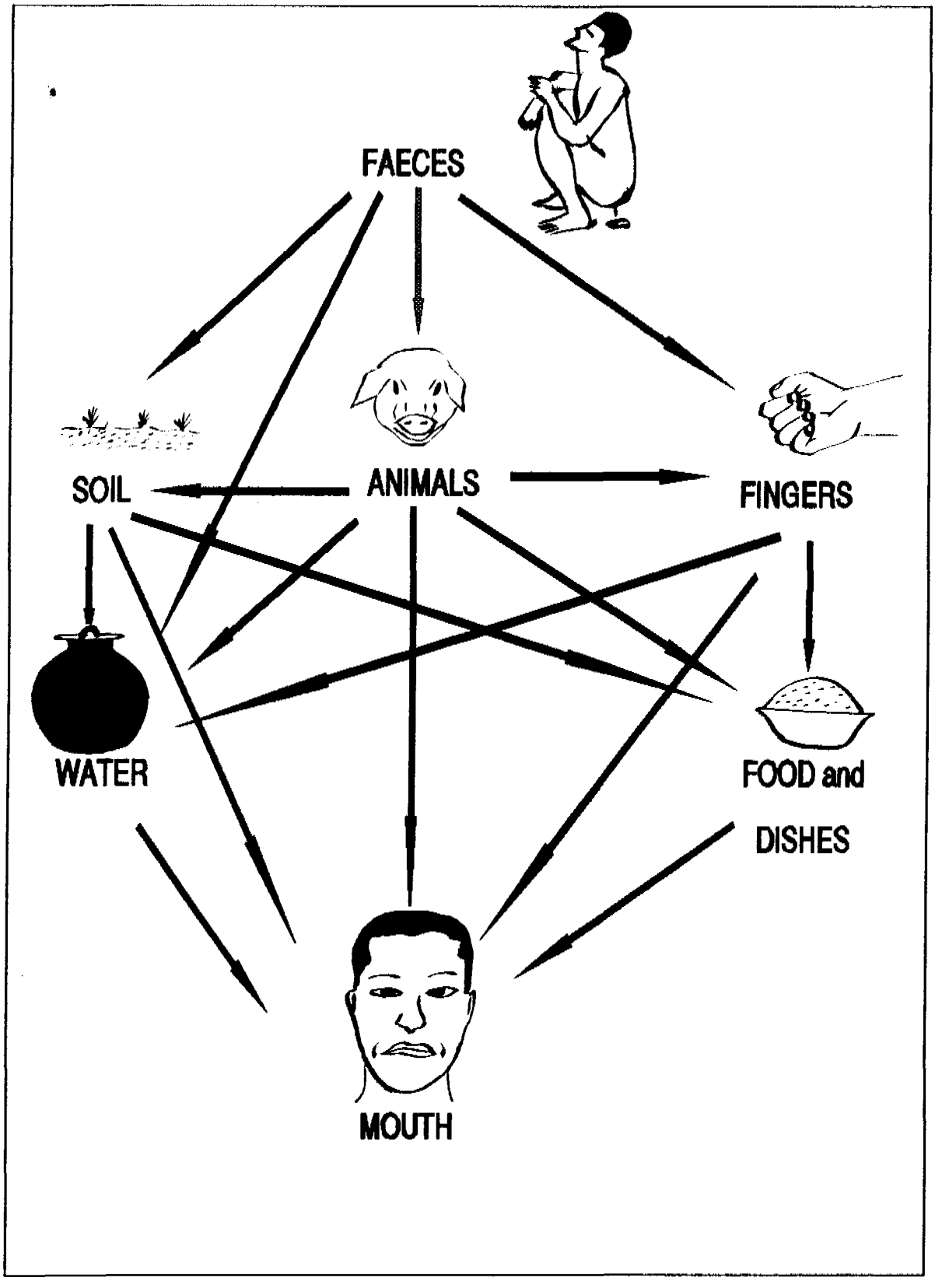
8.4.1 Control of insect vectors

8.4.2 Protection and purification of WATER SUPPLIES

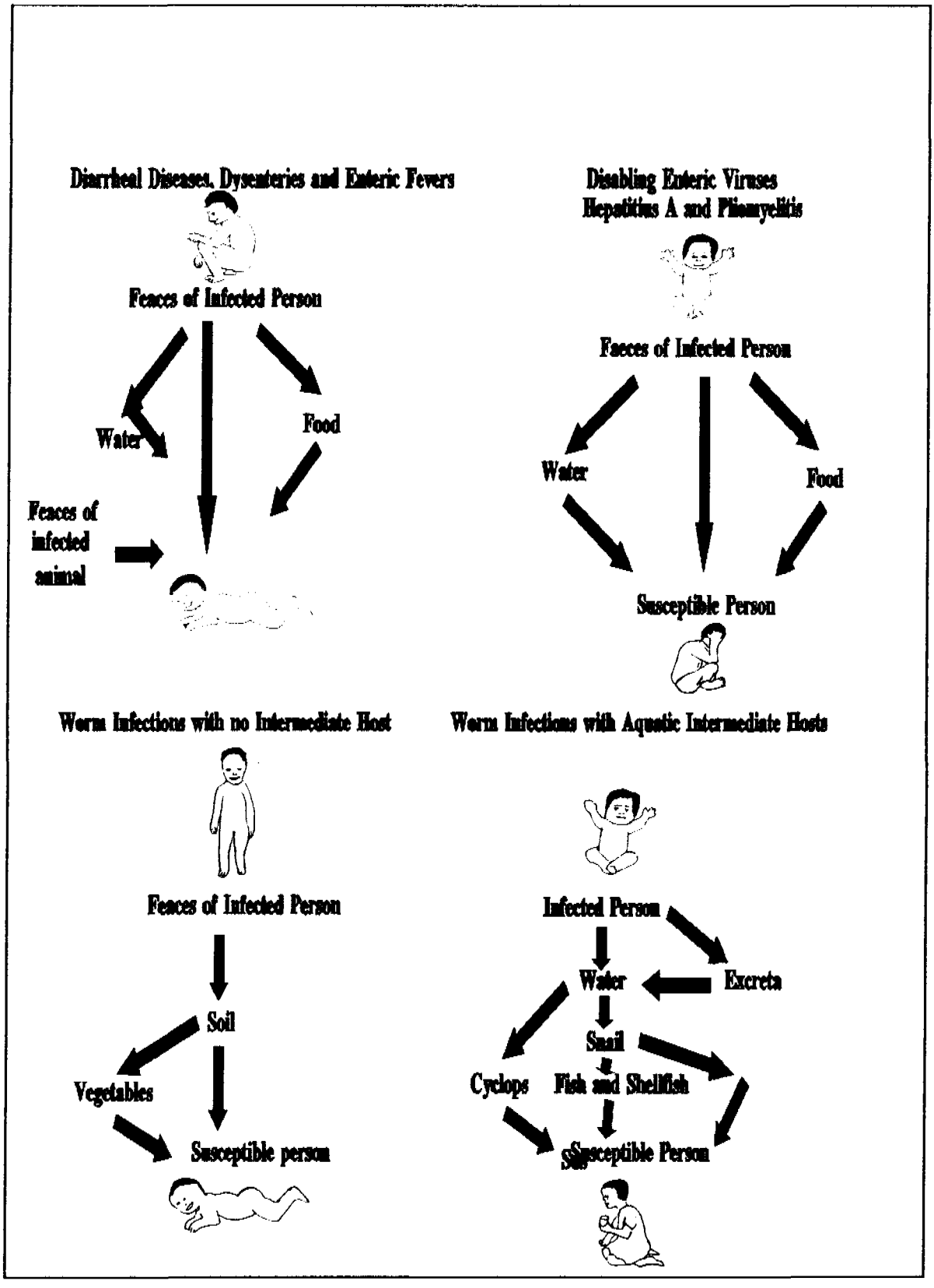
8.4.3 SEWAGE DISPOSAL

8.4.4 Food and drink (milk) sanitation

Transmission of Diseases



Transmission Routes



Worm Infections with Animals as Intermediate Hosts (Pig and Cow) - The Tapeworms

Feaces of Infected Person

↓

Soil

↓

Infected Cows/Pigs

↓

Infected Food

↓

Susceptible Person

Water-Related Insect-Borne Diseases

Blood of Infected Person

↓

Mosquitoes/Flies

↓

Susceptible Person

Skin, Eye, and other Diseases

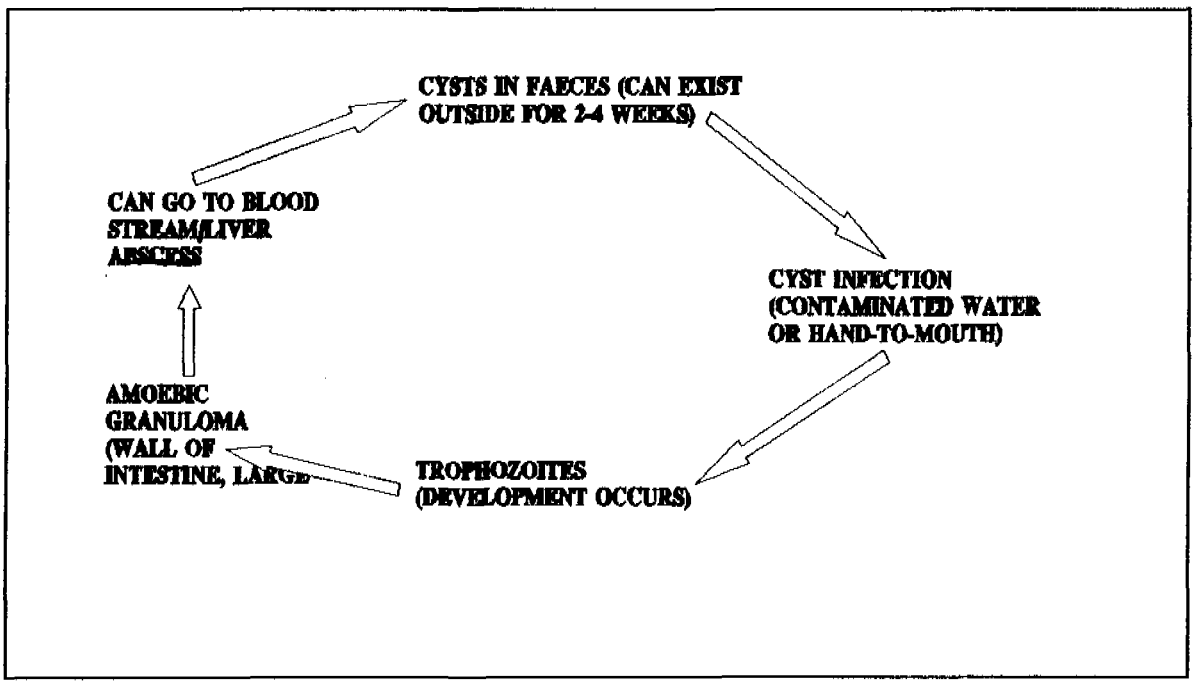
Infected Person

↓

Susceptible Person

Disease: Amebiasis (Amoebic Dysentery)

Infectious Agent:	Entamoeba histolytica; a protozoan
Mode of Transmission:	Endemic spread is by hand to mouth transfer of faeces,by contamined raw vegetables, food, flies, utensils, food handlers, occasionally by water. Outbreaks ewault mainly from ingestion of feacally contaminated water containing amebic cysts.
Host:	Humans, ascarid eggs in the soil
Reservoir:	Humans, usually a chronically ill or asymptomatic cyst passer
Symptoms:	Intestinal disorder, chills, fever, blood/mucoid diarrhoea often occurring in cycles of attack and remission
Treatment:	Drug treatment: flagyl: Fluid rehydration for 18-24 hours, then rice/bread etc. Avoid milk products
Preventive measures	Educate general public in personal hygiene, sanitary disposal of faeces, clean water supply, personal hygiene, fly control
Long Range Effects	Dissemination via blood stream can produce liver abscess. Ulceration of skin from intestinal lesions



Disease: Ascaris (Roundworm)

Neither sex, age or race confers any protection from infection, disproportionately high prevalence or intensity of infection in any individual sexual racial or age group can be directly related to socio-economic or cultural circumstances.

Eggs are passed at the single cell stage and take at least 2 weeks to become fully infective. Therefore human infection can **never** be a result of direct faecal contamination.

Acquisition of Disease

Humans become infected by eating eggs deposited in faeces from other infected people usually from contaminated food, hands, utensils, dust, flies, animals etc. Transmissions in yards and compounds contaminated by faeces, no sanitation or poor sanitation facilities. Children mainly responsible, adults tend to use discrete defecation sites. The eggs must be fully embryonated when they enter the body, the young larva hatches out in the intestine and migrates through the body (see life cycle diagram) before coming back to the intestine to mature.

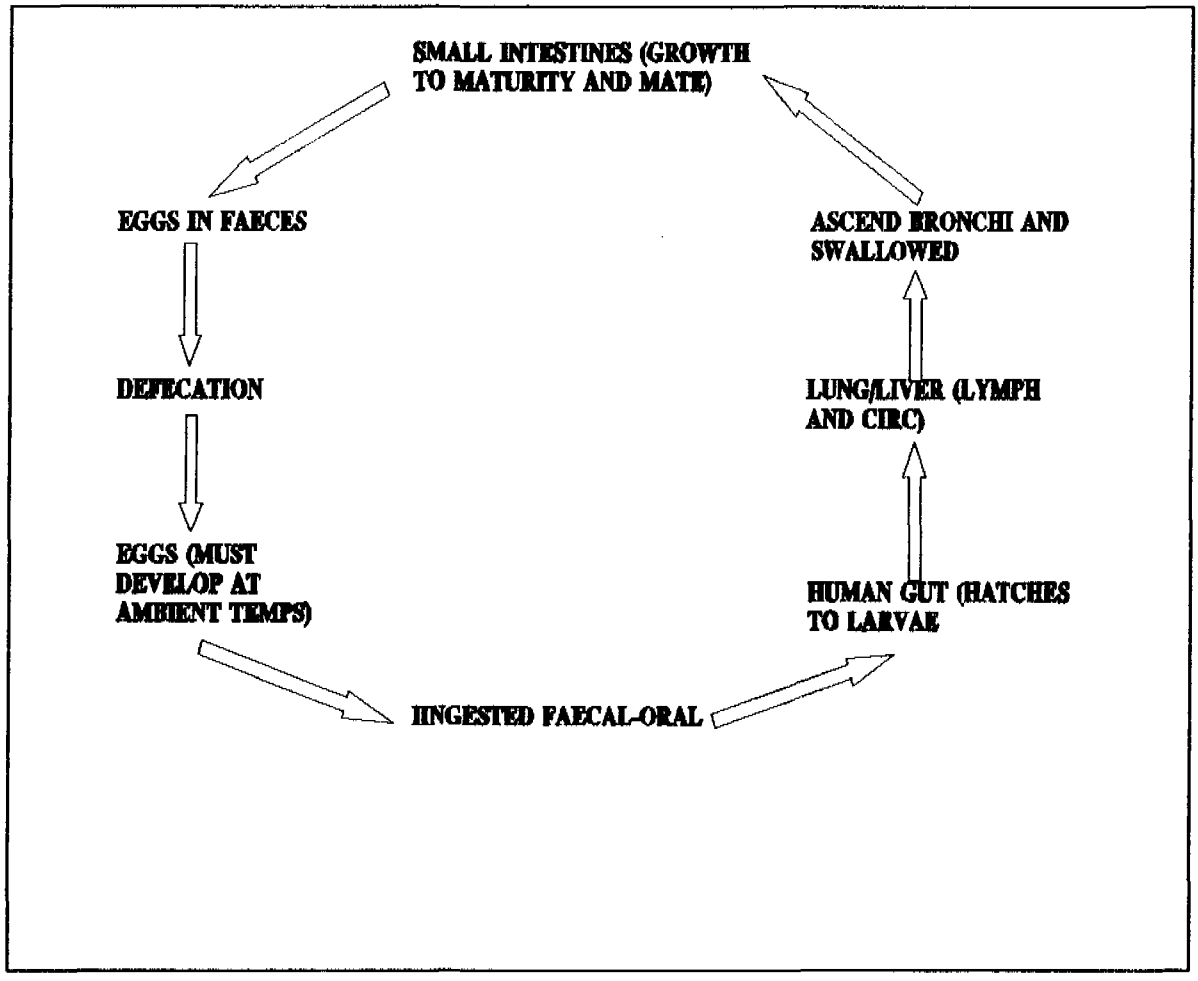
Eggs passed in faeces are extremely resistant and may remain in an infective state in the soil for many years. They can survive prolonged periods in water and temperature up to 45° C.

Community infections: mainly through children, in schools in particularly with inadequate sanitation facilities, play areas, streets, gutters, market places.

Control Strategies

1. Sanitation improvements, especially latrines suited for children
2. Control over wastewater/night soil reuse
3. Chemotherapy, only effective if combined with sanitation improvements and education. In the absence of sanitary improvements Ascariasis may return to pre-treatment levels in 5-8 months.

Infectious Agent:	Ascaris lumbricoides: large intestinal roundworm
Vector/Vehicle:	Faecal-Oral by contaminated food or water
Host:	Humans
Reservoir:	Humans
Symptoms:	Hacky cough, stomach pains, vomiting, digestive problems
Treatment:	Drug treatment: Dewormer
Prevention	Proper latrines and use, sanitary hygiene, prevent soil contamination in areas immediately adjacent to houses and schools, particularly in children's play areas.
Long Range Effects	Bowel obstruction. Migration of worms to liver, gall bladder, or appendix which can cause death



Bancroftian Filariasis ("Matende Kuu")

Brancoftian filariasis is an infection caused by the nematode Wucheraria bancrofti which normally resides in the lymhotics in infected persons. The disease is characterised by microfilaremia, acute recurrent filarial fever and hyphadanitis. Those with chronic signs include hydrocele, chyluria and elaphantiasis of the limbs, breasts and genitalia.

Causative Agent - Wucheria bancrofti; long threadlike worms.

Reservoir - Man with microfilaria in the blood.

Mode of Transmission - By a bite of a mosquito harbouring infective larvae. W. bancrofti is transmitted by many species, the most important being Culex fatigans, Anapheles gambiae and Anopheles funestus. In the female mosquito, ingested microfilaria penetrate the stomach wall and develop in the thoracic muscles into elongated, infective filariform that migrate to the proboscis. When the mosquito feeds, the larvae emerge and enter the puntured skin following the mosquito bite. They travel via the lymphotics to the lymph nodes where they moult twice before becoming adults.

Susceptibility and Residence

Universal susceptability to infection, but considerable geographic difference in the type and severity of disease. Repeated infections occur in endemic regions and lead to the severe manifestations susch as elephantiasis.

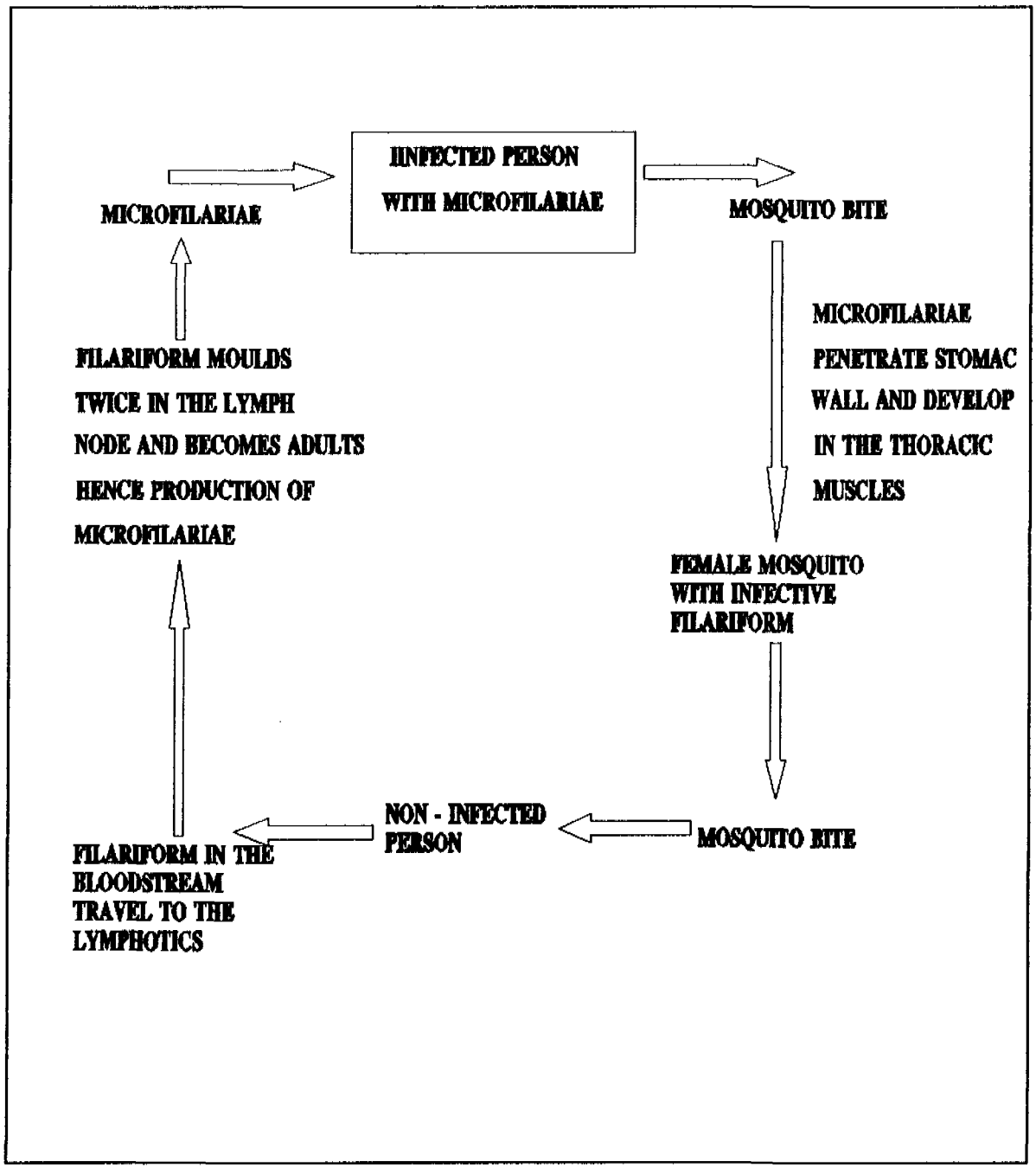
Control Methods

1. Educate the public on the mode of transmission and methods of mosquito control.
2. Identify the vectors by detecting infective larvae in mosquitoes caught on human bait; identify times and places of mosquito biting and locate breeding places. Eliminate breeding places and treat other with larvicides. Spary inside

walls (rooms) with a residual insecticide, screen houses, or use bed nets and insect repellants.

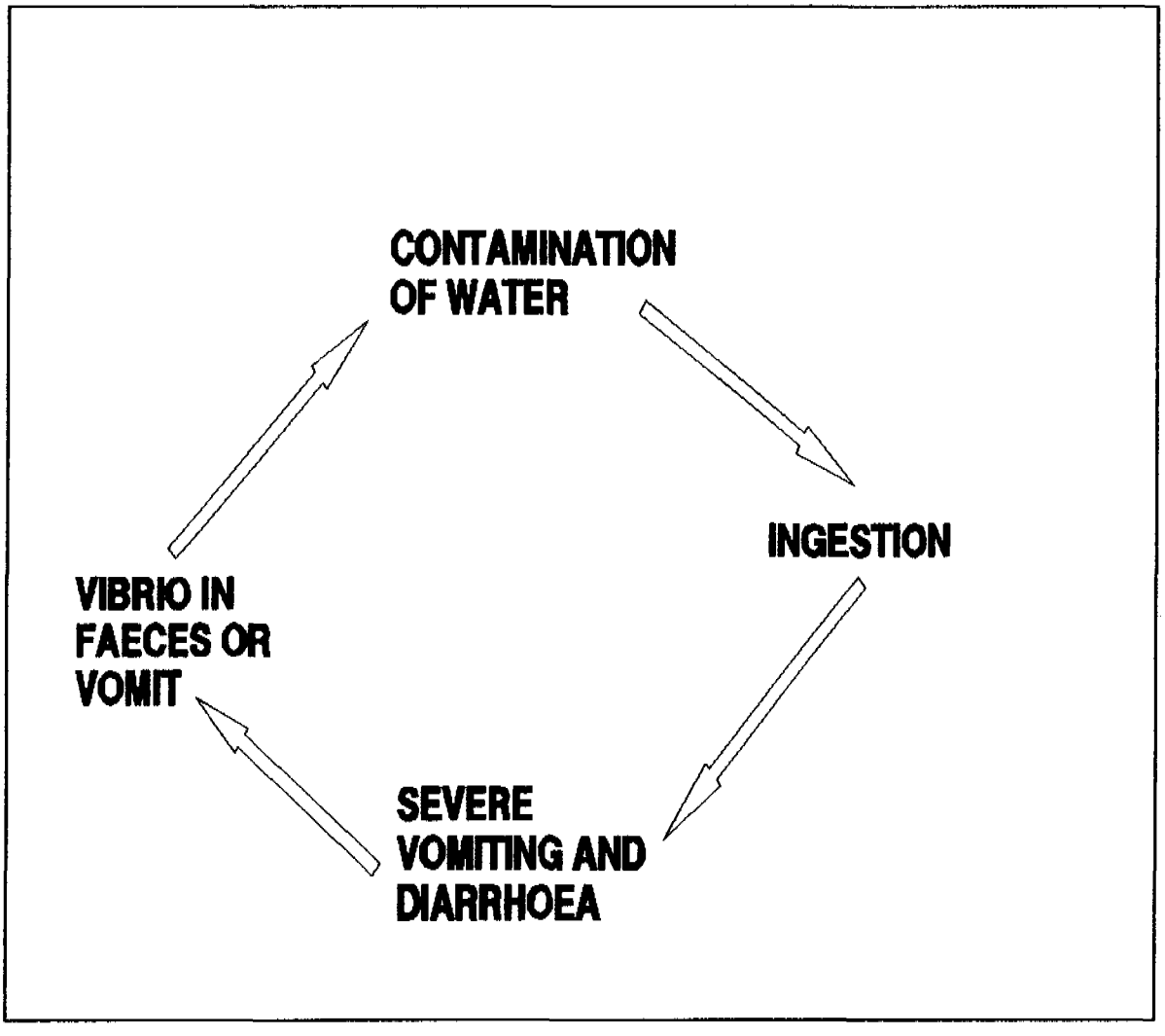
3. Long term control may involve changes in housing construction to include screening, and environmental control to eliminate mosquito breeding sites.

4. Mass treatment of the community with suitable drugs.



Disease: Cholera

Infectious Agent:	Vibrio cholerae: comma vibrio bacteria
Transmission / Vector / Vehicle:	Faecal-Oral by contaminated water (sometimes food, flies, direct contact), raw or undercooked seafood.
Host:	None
Reservoir:	Humans
Symptoms & Signs:	Severe vomiting/diarrhoea, rapid dehydration
Treatment:	Fluid rehydration. Drug treatment: antibiotics
Prevention:	Proper latrines/use, sanitary hygiene, improved water supply, vaccination
Long Range Effects:	If untreated, can cause rapid death



DIARRHOEA

A Major public Health Problem

Children most at risk, between 2 and 15 diarrhoea is main cause of death. Children being weaned are the children at risk to get diarrhoea.

- 2 episodes per child per year, on average. First three years of life are most critical.
- 4 deaths per 1000 children per year. Major cause of death to age of 15
- Seasonality (viral diarrhoea peaks in cool season, bacterial in warm season)
- Reduced body weight
- Dehydration - ORT: Oral Rehydration Therapy
- Breast is best
- Improved water supplies and sanitation, with hygiene education

Causative agents of diarrhoea

Viruses: Rotavirus
Norwalk and Norwalk-like agents

Bacteria: Campylobacter jejuni
Pathogenic Escerichia coli
(especially enterotoxigenic E.coli - ETEC)
Salmonellae
Shigellae
Vibria cholerae
Vibrio parahaemolyticus
Yersinia entercolitica

Protozoa: Balantidium coli

Entamoeba histolytica

Giardia lamblia

Helminths: Trichuris trichiura (whipworm)

Stongyloides stercoralis

Interrupt Transmission:

- **Clean and Plentiful water supply**
- **Improved personal and domestic cleanliness**
- **Improved sanitation**

Hookworm

Hookworm disease (Ancylostomiasis) in humans is caused by 2 nematodes; Ancylostoma duodenale and Necator americanus each with distinct geographical distributions (see map). Most species are curved giving it a hook-like appearance and therefore the name hookworm.

There is no intermediate host, man is the reservoir for human hookworms.

Acquisition of Disease

Infection usually occurs when third stage juvenile worms (filariform larvae) come into contact with the skin and burrow in. Any skin can be penetrated although parts most often in contact with the soil ie hands, feet, ankles, buttocks, are most usually attacked.

Eggs passes in faeces remain in the soil at the defecation site and will survive for 3 weeks in optimum conditions.

Acquisition sites and patterns

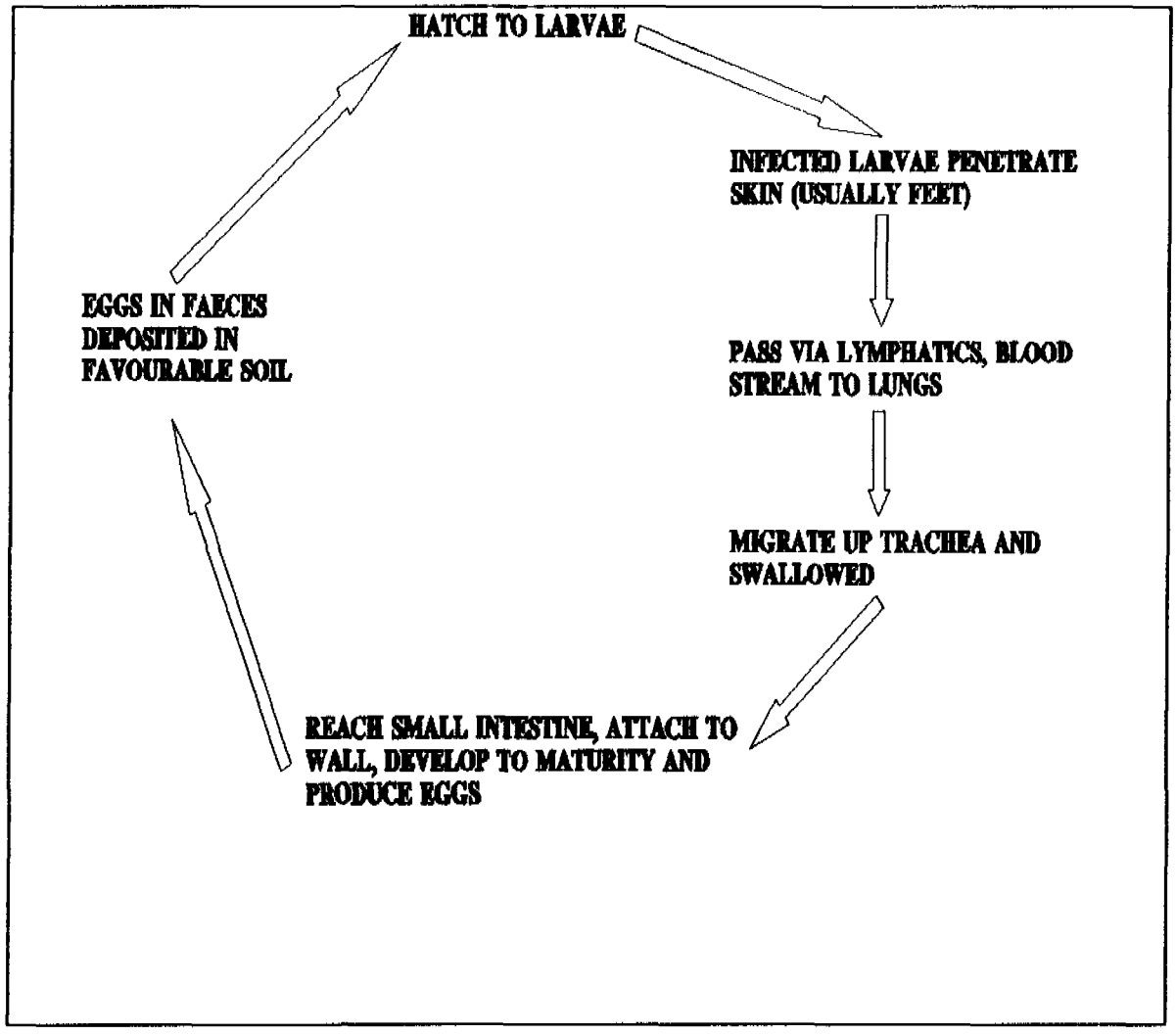
- Communal defecation sites, especially shady plantations, in or near fields
- Mainly a disease of rural areas
- Prevalence is lower among children under 5 and sometimes in elderly adults presumably reflecting less involvement in field work

Clinical Features of Hookworm disease

1. "Ground itch", "creeping eruption" - skin penetration
2. Coughing, bronchitis, pneumonia - lung migration
3. Intestinal pain/soreness - adult establishment
4. Nausea, vomiting, diarrhoea - acute infection
5. Blood loss, iron los, anaemia, - chronic infection
   heart failure, protein deficiency, malabsorption of nutrients
6. Long range effects: Retarded mental and physical development in children, general debilitation

Control Strategies

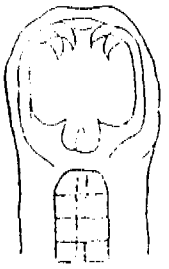
- Use of shoes
- Environmental level
  - Improvement of excreta disposal
  - Defecation in fields ?
- No prophylactic drugs available
- Chemotherapy + Oral Iron therapy
- Drug treatment; tetrachlorethylene, bephenium, thiabendazole, or pyrantel pamoate. Protein and iron diet supplement.



The Hookworms

Ancylostoma duodenale

Old world

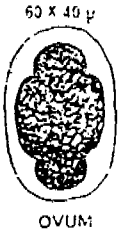


BUCCAL CAPSULE

2 pairs of teeth.

BURSA

Dorsal ray - shallow cleft - tips tridigitate.

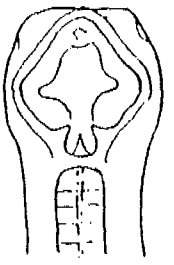


60 x 40 μ

OVUM

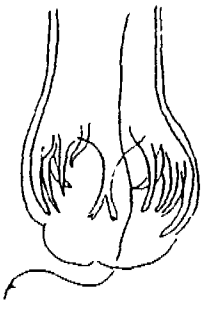
Necator americanus

New world



BUCCAL CAPSULE

Cutting plates

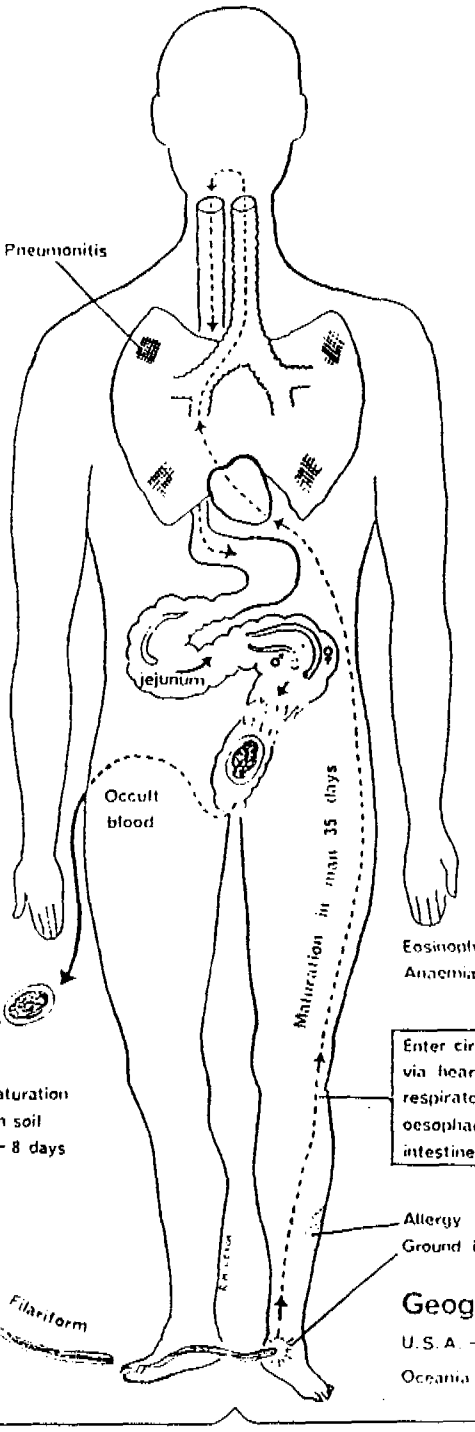


BURSA

Dorsal ray - deep cleft - bifid tips - spicules fused and barbed.

70 x 38 μ

OVUM

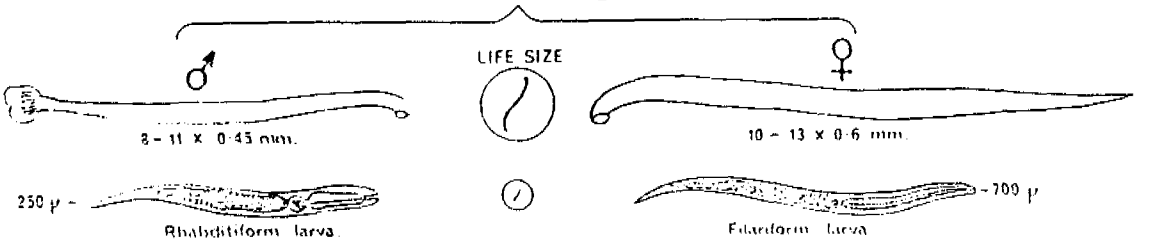


Geographical distribution

Europe - N. Africa - India - S.E. Asia.

Geographical distribution

U.S.A. - Central America - Central & S.W. Africa - Oceania - S.E. Asia.



CYCLE AND PATHOLOGY IN MAN

1. Infection - General allergic reactions - ground itch - cutaneous larva migrans in non human ancylostomes
2. Migration - Lung involvement - localised pneumonitis - eosinophilia - allergy
3. Localisation in jejunum - ingestion of blood by parasites - occult bleeding from intestinal mucosa - anaemia (and sequelae).

LABORATORY DIAGNOSIS

Ova in stools.

Disease: Malaria

1. Introduction

Malaria is after diarrhoea (a large number of organism can give diarrhoea of which malaria can be one) the most devastating disease in the developing world. As a single disease malaria is the most common infectious disease in the world. Especially the group of under the age of five are the victim as they still have to become naturally immune. Before becoming immune one needs to have had the disease a few times.

The disease was brought under control in various countries in the world. After malaria looked to be under control, the control measures were not continued. The result is that in some of those countries the disease is rampant again.

On the coast of Kenya, malaria might be the bigger killer of children and adults then any other diseases. A combination of malaria and diarrhoea and maybe other faecal-oral diseases can lead to a certain death. The control of malaria on its own can namely be difficult enough to treat.

It is essential before embarking on control of the disease to understand the natural history of the disease. It is important to know how a single disease can vary in its effect. It is important to know how one can minimize the disease within the area with the help of affordable means. It is namely out of the question that the government will take up the control in the rural areas as that is not cost effective. This means that the population in the rural areas need to know with which means the disease can be controlled and to chose that method which they can afford and sustain.

2. Malarial parasites

Malaria is a disease caused by infection of the red blood cells by a protozoal organism called Plasmodium of which there are four types that are affecting humans (see Table 1).

Table 1: Malaria species

Plasmodium falciparum	most dangerous of all malarial parasites, *malignant tertian, most common in hot, wet* climates
Plasmodium vivax	Benign tertian, is most widespread and is more common then falciparum
Plasmodium malariae	Quartan group, is not common
Plasmodium ovale	Ovale group, is very uncommon

2.1 The Life Cycle (see picture)

For all the above mentioned types of malaria, man is the only host in Kenya and does not appear in any other animal.

The only vector is the female Anopheline mosquito. The function of the male is only to fertilize the female. The female needs the blood to be able to reproduce. It can be of importance to know the species that transmits the malaria as that can dictate the character of the disease and the difficulty involved to get rid of the vector.

It is more important to know the fine details of the malarial parasites and its vectors then any other parasite or disease. The minute details of the habits of the vector are similarly important to be able to effectively control the vector.

The figure with life-cycle of a primate malaria parasite needs to be studied carefully when discussing the subject.

2.1.1 The cycle occurring in man

The infected female mosquito bites (everybody talks about biting but in actual facts one gets pierced) the person and injects saliva that apparently acts as an anticoagulin on the blood and at the same time the SPOROZOITE enter into the bloodstream. The sporozoite is the infective stage of the Plasmodium. In an hour these have invaded the cells of the liver. Then start a process in which it grows and divides into thousands of MEROZOITES this takes between 5 - 15 days. This is called the PRE or EXO ERYTHROCYTIC CYCLE. In P. vivax and P. ovale only, certain sporozoites do not develop in this way and turn into "sleeping" forms (HYPNOZOITES) which divide 8 - 10 month later, this is termed a relapse. The hypnozoites are unharmed by normal treatment and therefore dangerous as a relapse can occur unexpectedly. In P. vivax

multinucleatum the incubation period is about 320 days - 1st relapse 67 days. This fits in with cold climate mosquitoes which only bite in summer).

The Merozoite, which is released from the Pre-Erythrocytic Schizont immediately penetrates a young red blood cell (= R.B.C.) and starts the Erythrocytic Cycle of development. This has 2 phases: the asexual cycle and the sexual cycle.

2.1.1.1 The Asexual cycle

The merozoite forms a ring-shaped TROPHOZOITE and starts to divide into between 8 - 32 daughter merozoites when it is termed a SCHIZONT, which bursts and releases them into the circulation.

The merozoites immediately re-invade other erythrocytes, the cycle taking 48 (tertian) or 72 (quartan) hours, while the pigment is taken up by the white blood cells.

The asexual cycle is repeated indefinitely. The typical Malaria fever occurs each time the new merozoites are released.

2.1.1.2 The Sexual cycle

Some merozoites do not divide but turn into male and female forms. These sexual forms are called GAMETOCYTES (micro-male and macro-female). These do not divide until ingested by the mosquito.

Only the Gametocytes can infect the mosquito. These can appear three days after parasitaemia (parasites in the blood) and may degenerate after 12 hours, to be replaced at the next cycle of development. P. falciparum only forms gametocytes after 10 days.

2.1.2 The cycle occurring in the mosquito

In the mosquito the microgametocyte produces 8 slender flagellae which are the male Gametes. These seek the female Gamete and fertilise it to form the ZYGOTE. This can occur in any biting insect but the Plasmodium can only develop in certain species of Anopheline mosquito. Some species make better hosts than others. The fertilized zygote forms a mobile OOKINETE which invades the stomach cells and encysts to form the OOCYST. Here the sporozoites develop - burst out and travel to salivary glands - from where they are injected into the human host - and the cycle

starts again.

NOTE:

i. The asexual cycle in the red blood cell takes:

48 hours in P. falciparum, P. vivax and P. ovale

72 hours in P. malariae

ii. If the infection occurs via the placenta or an infected transfusion, the sporozoite is not involved and the hepatic cycle impossible. There is thus no possibility of relapse after treatment.

iii. P. falciparum is the most dangerous - and is becoming increasingly resistant to drugs.

Plasmodium vivax and ovale can both recur after normal treatment - as the liver forms are not reached by the common drugs.

2.1.3 The effect upon man

A typical attack has three stages.

a. It begins with chills and often headache and weakness. The person shivers or shakes for 15 minutes to an hour.

b. Chills are followed by fever, often 40° or more. The person is weak, and at times delirious. The fever lasts several hours or days.

c. Finally the person begins to sweat, and his temperature goes down.

Children get malaria more often when they are given foods other than breast milk. At this young age complications can be serious:

- Repeated fevers lead to general ill-health with slowing of growth.
- Thinning of the blood, due to destruction of red blood cells, can come very quickly, within a day or two.
- Fits or convulsions may be followed by unconsciousness. The breathing may be rapid and deep. See if the palms show a blue-grey colour.

A child that survives these attacks of malaria when young is no longer affected by malaria as an adult, except at times of special stress, e.g. after heavy work, childbirth, or after an operation or exposure to cold.

The effects are:

i. Anaemia: due to destruction of the red blood cells by the parasites and by phagocytes and by auto-destruction. Blood formation is reduced.

ii. Spleen: the spleen enlarges early and may become enormous. It is often used as an indicator of the disease.

iii. Brain and Kidney: the brain may be affected in P. falciparum infections and causes Cerebral Malaria; also the kidney - impairing the function.

iv. Pregnancy: infections can cause abortion, stillbirth and low birth weight.

v. Immunity: repeated attacks can cause the formation of an immunity, which gives some protection. Immunity is inherited from the mother, falls away by 6 months and has to build up in the young child. It is only against asexual forms. So far there is no vaccine, although work is being carried out in many centres. One problem is that each stage of development needs a different vaccine.

vi. Fatality - P. falciparum: will kill non-immune person in a week or so:
   a. because more merozoites are released, in the exo-erythrocytic cycle.
   b. because the asexual multiplication is greater.
   c. therefore, a bigger proportion of red blood cells are infected
   d. cerebral malaria can occur

vii. Late effects: Hyperactive Malaria Syndrome usually with P. malariae or P. vivax.

2.1.4 Treatment

- The majority of the drugs attack the Schizont: Quinine, chloroquin, amodiaquin.
- Pamaquin attack the pre-erythrocytic (liver) phase and thus prevents recurrence. These drugs also attack sexual forms and kill gametocytes. However, they are more dangerous to use, meaning more site effects because of the drug.
- The development of the parasites are stopped by Proguanil and

Pyrimethamine used as prophylactics. Also stop development of gametes in the mosquitoes blood meal. No drug kills the sporozoite.

Resistance of the Plasmodium to all drugs is there. New drugs are urgently needed:

- eg. Quinghaosu (China), Mefloquin etc. are being developed. Quinine may often be used as well as quinidine.

There is no certain prophylactic against malaria.

What should not be forgotten when using drugs that some are poisonous to the body, so called side affects, like Fansidar and Maloprim.

Tetracycline is a widely used addition to Quinine therapy.

2.1.5 Resistance

Drug resistance in Malaria is defined as 'the ability of a parasite strain to multiply or survive in the presence of concentrations of a drug that normally destroys parasites of the same species or prevents their multiplication'. Such resistance may be relative (yielding to increased doses of the drug tolerated by the host) or complete (withstanding maximum doses tolerated by the host).

Resistance to Quinine, noted in 1910 - but rare even now.

to Chloroquin, since 1960 and now rapidly increasing

to Pyrimethamine, rapidly since 1958.

Chloroquin resistant parasites: are more infective to the vector

overgrow sensitive strains on medicines grow quicker

Therefore it is expected that a resistant strain to <u>increase even in the absence of drug therapy</u> because of a biological advantage.

3. Outbreaks

Malaria has a very different character in different parts of the world.

'UNSTABLE' or 'EPIDEMIC' is catastrophic with high mortality in every age group for example in Punjab. Control in these areas has been relatively easy.

People are only challenged at certain seasons - immunity drops and all are at risk.

'STABLE' or 'ENDEMIC' is on-going with a high mortality only among small children and a complete absence of control in many areas, Sub-Saharan Africa. People are challenged continually.

The former is a disease killing thousands in acute epidemics and gives little or no immunity to re-infection. The latter is characterised by chronic ill health, mild symptoms and a reduced economic output from the affected people coupled with a high infant mortality.

4. The transmission of the disease

The causes affecting transmission of the parasite in man can be classified as follows:

The Cycle of Transmission: Biological cycle from person - mosquito - man

The Chain of Transmission: Passage of parasite from donor to recipient.

4.1 The factors concerning the vector

[Longevity: effectiveness as vector; house or forest biter; biting frequency; animal/man preference]

The vector must always be a female Anopheline mosquito, which must ingest a male and female gametocyte.

a. It must be species capable of being infected by gametocyte (species vary in their efficiency as hosts);

b. The biting habits:

   Preference of each species for person or animal;

   The ratio of feeds taken from person to animal;

   The frequency of blood meals;

c. The density of the mosquito compared to the human population.

d. The longevity of the species: the length of life after the extrinsic cycle is complete governs the length of the infective life.

   Probability of surviving one day or longer

e. Length of the extrinsic cycle varies with both the species and temperature and type of parasite.

The breeding habits and species variation dictate the dominant vector species. These are most important from engineering considerations.

4.2 Factors concerning the parasites

a. The type of parasite: P. falciparum is more virulent: no hypnozoites. P.viva has hypnozoites and relapses.

b. The persistence of the parasite in persons: eg. greatest in P. malariae. Different species have different incubation periods. Some type of P. vivax = 320 days (P. vivax multinucleatum).

c. Temperature: no plasmodium can develop outside the range 15° - 32° Optimum temperature gives fastest extrinsic cycle. Different species differ in response to temperature, eg.

Minimum temperature for P. falciparum = 20° C.

Min. temp. for P. vivax = 15° C.

Length of extrinsic cycle:

P. vivax	16° C	55 days
	25° C	12 days
	28° C	7 days

Table 2 Different Species Develop at Different Rates

At 25° C	Extrinsic Cycle	Intrinsic Cycle	Gametocyte	Persistence in persons	Relapse
P. vivax	10 days		Profuse & early	3-5 years	Yes
P. falciparum	12 days	Fastest	Profuse & late	1-3 years	No
P. malariae	28 days	Slowest	Scanty	30 years	No

d. Gametocyte Formation and Behaviour

They are short-lived and vary in rate of production.

e. The four main species have different strains, with different characteristics. Eg. some incubation periods favour certain vectors which may be seasonal (strains of P. vivax). Some strains are resistant to chloroquin.

4.3 Factors concerning man

4.3.1 Genetic factors

a. A certain deficiency gives some protection, but is relatively rare and not very useful as that gives other problems.

b. Some other problems with red blood cells give the plasmodium problems but the person has problems her/himself so also not very useful.

4.3.2 Immunity

The immune state of the population is most important in governing the speed or spread of the disease and the effect on the individual. However the cost of immunity is 10% of the children.

The individual is protected against reinfection and has a lower morbidity. the community is protected because gametocyte formation is limited.

It depends on the continuity of the challenge and the strength of the confrontation. Immune individuals can still act as reservoirs.

Immunity acts mainly against the asexual cycle. So reinfection with sporozoites may still occur and may trigger the immune response.

Inherited immunity lasts only a few months. The crucial change from declining passive immunity from the mother, to acquired active immunity taking place at six months. Vaccine development is now a key issue in control.

4.3.3 Infectivity

Gametocytes occur most commonly in children in endemic situations, but in all ages in endemic areas. Immunity tends to suppress gametocyte formation.

Table 3 Infected cases

Age	Infected cases with Gametocytes
2 weeks - 2 years	40%
5 years - 9 years	28%
10 years - 15 years	15%
15 years +	5%

5. **The measurement of transmission** (MacDonald's model)

Malarial transmission is measured by combining as many factors as possible into a formula to estimate how many cases of malaria originate from one primary case. This is termed the Basic Case Reproduction Rate (BCRR).

If the BCRR is greater than 1 then the disease is increasing. For each infecting case is producing more than one other. But if the BCRR is less than 1, then the disease is dying out.

The Net Reproduction Rate (NRR) is the actual increase and may differ from the theoretical value.

In an endemic area where everyone is immune there could be 3000 infective bites from one case, but only one new case. Ie. BCRR = 3000 and NRR = 1.

Putting the factors together:

ma the mosquito bites a person who is infected (number of mosquitoes x biting habit)

p^n the mosquitoes start to die off, the probability of survival (p = probability of survival and n= no. of days).

1/- log e p The infective mosquitos have an expectation of life

a the infective mosquitoes then bite an other person

b there are a certain number of successful infections

1/r the longer a case is infectious the more mosquitoes are infected

Thus the BCRR:

$$m.a.p^n.\frac{1}{-\log ep}.a.b.\frac{1}{r}$$

Drainage and larvicides reduce the number of mosquitoes. The formula shows this to have a relatively small effect.

Nets and screen reduce the number of bites (a^2), which has a greater effect, namely to the power of 2.

Imagicides in house spraying reduce survival (p^n) and reduce transmission by the power of n and has the greatest effect.

If a mosquito has a low survival and short life span, only a small reduction in the longevity will eliminate transmission. This means that the disease should disappear, the immunity will fall and the Malaria be UNSTABLE.

A similar reduction in a long lived species would not reduce the BCRR to less

than 1. Immunity will not be lost and the disease will remain STABLE.

6. Measuring malarial endemicity

6.1 Spleen Rate

The spleen makes some of the white blood cells and some antibodies. The spleen also takes 'worn out' red blood cells from the blood. It breaks them down and saves most of the parts for the bone marrow to make new red blood cells. Anytime the spleen enlarges, it can start taking normal red blood cells, normal white blood cells, and normal platelets out of the blood. The body may then not have enough of some or all of these blood cells.

Classified into Holo-, Hyper-, Meso- and Hypo- Endemic.

6.2 Parasite Rate

By age, season and area. Age specific rate. Particularly the infant rate can be 100% by 3 years and 25% in adults. Parasitaemis suppresses immune response to bacteria.

6.3 Gametocyte Rate

Shows infective population. Highest in children.

6.4 Anti-body Rates

Maybe 100% at birth, falls and rises to be 100% by 2-3 years of age and the individual immunity is built up.

6.5 Entomological Data

It is important to get to know the vector, the type, habits, feeding pattern. Number of vectors with human blood in gut. Age of vector population and density. Breeding habits.

7. Control of Malaria

The best method of control is not to get bitten at all. This is not as easy of course as it sounds but possible if one really wants.

The contribution of MacDonald and the change to imagicidal measures with the advent of DDT revolutionised the concept of control and with the newer drugs made eradication a possibility. Unhappily not to be realised.

Eradication: implies complete interruption of transmission and elimination of the parasite reservoir over a limited period of painstaking and intensive effort.

Control: implies measures that will reduce transmission to low levels, but which requires indefinite maintenance.

Failure of eradication was basically due to poor organisation, logistics, insufficient epidemiological research and the development of resistance to DDT in mosquitoes and to chloroquin in the parasite. Other factors include the feeding habits of the species of vector. Drop in aid and the rise in cost of the insecticides. 'Eradication' gave way to 'control' which became the WHO policy.

Tropical Africa is largely untouched and malaria accounts for 10% of infant deaths before immunity is gained.

7.1 Methods of control

Vector control	House spraying; exterior spraying; genetic control
Larvicidal measures	Drainage; larva eating fish; oiling water surface, B. thuringiensis etc, nematodes
Drugs	Treatment and Prophylaxis
Protection	Nets, screens, repellents, impregnated nets
Research	New drugs, new insecticides, biological control and work on vaccines

8. Environmental management in malaria control

The principle of environmental management is to create conditions that make the transmission of the parasite by the bites as unlikely as possible and to make the breeding unlikely in the neighbourhood of people.

Technical, economic and social aspects can play a varying role in the control. Community involvement is needed, that means they need to be explained and made clear that any control is as good as the after maintenance.

Planners need to have mosquitoes on their mind as well as some other diseases when planning projects especially if drainage is involved. Any water puddle can create mosquito problems.

8.1 Transmission

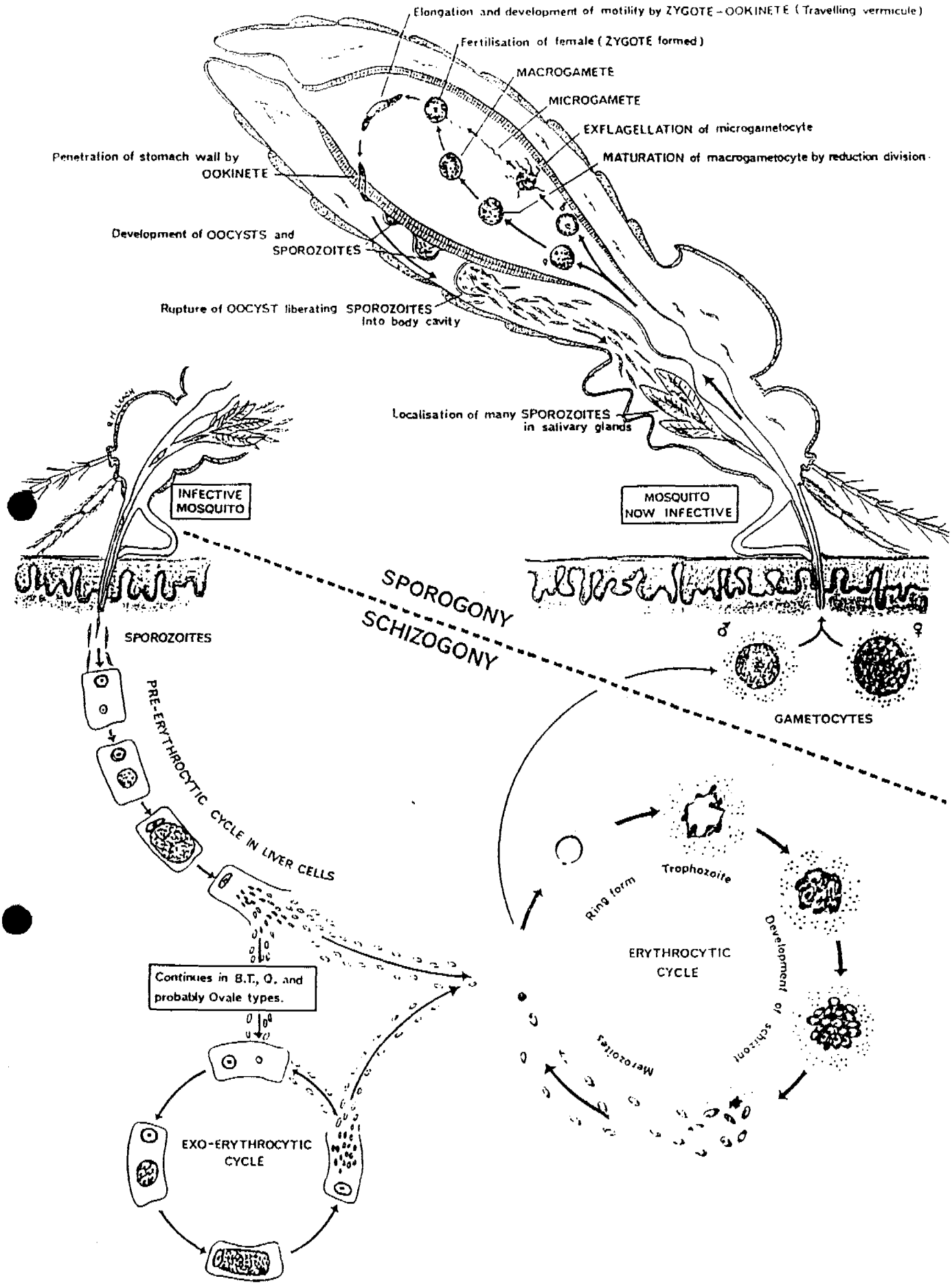
Make the transmission of the mosquito as unlikely as possible.

- Design of houses; netting; ventilation
- Sting of houses
- Clearing vegetation and bushes from the immediate vicinity of the house
- Avoiding old receptacles (tins, tires, gourds, etc.) that could hold small amounts of water
- Good drainage of household waste and storage
- Covering all water tanks and storage vessels
- Putting cattle sheds between house and breeding areas

8.2 Breeding

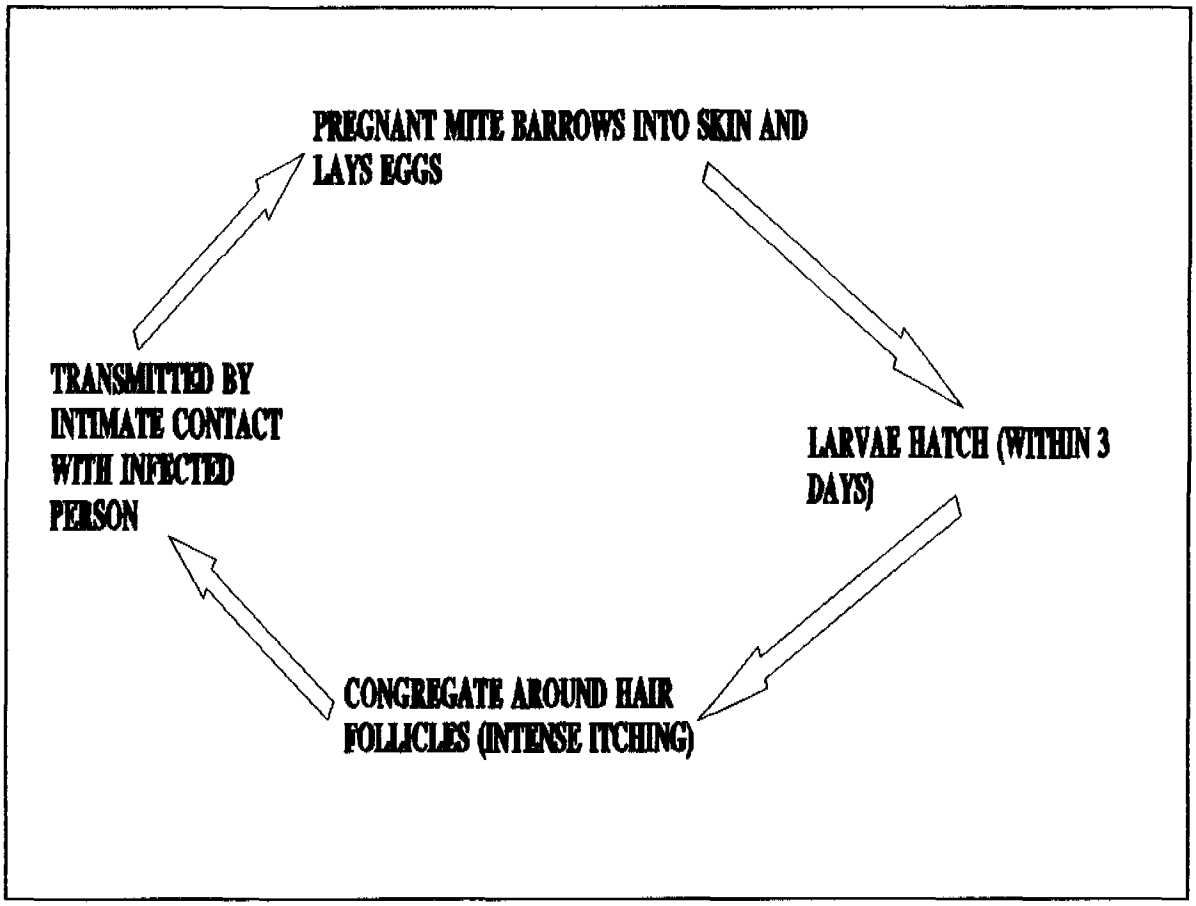
Make mosquito breeding unlikely within an effective radius from the house, from 1.5 km to 7 km depending on vector. Take into consideration the prevailing wind.

Life Cycle of Malarial Parasites



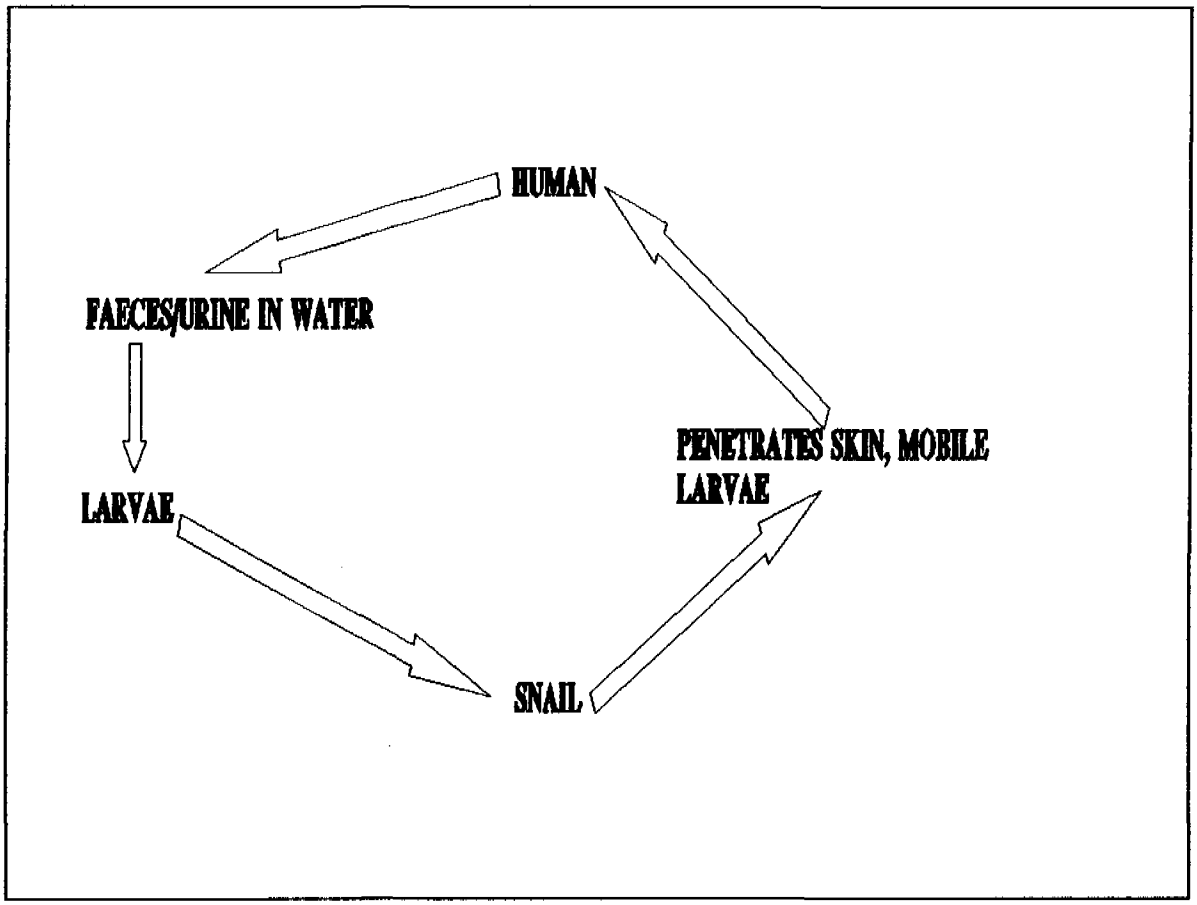
Disease: Scabies

Infectious Agent:	Sarcoptes scabiel: a microscopic mite
Vector/Vehicle:	Direct contact, garments, bedclothes
Host:	None
Reservoir:	Humans
Symptoms:	Intense itching, lesions
Treatment:	Cleansing bath followed by ointment
Prevention	Sanitary hygiene, bathing, cleaning of garments/bedclothes
Long Range Effects	Repeated scratching can cause secondary infection



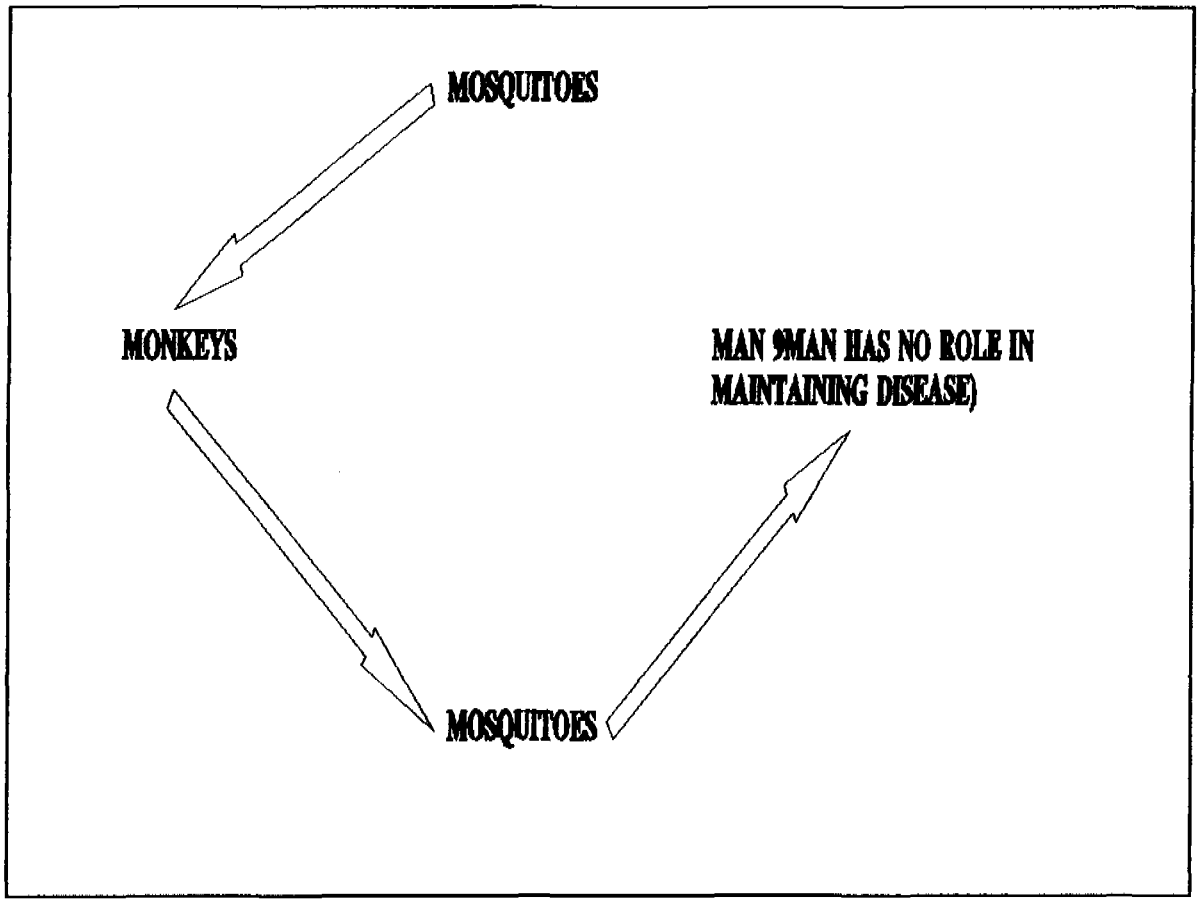
Disease: Schistosomiasis (Bilharziasis)

Infectious Agent:	Larval eggs of Schistosome mansoni, haematobium, and intercalatum
Vector/Vehicle:	Water
Host:	Appropriate freshwater snail intermediate host
Reservoir:	Human
Symptoms:	Chronic infection, stomach pains, blood in urine
Treatment:	Long-term intramuscular drug injections
Prevention	Disposal of faeces/urine, snail control, protective clothing, brisk towelling after contact
Long Range Effects	General debilitation, death



Disease: Yellow Fever (Jungle)

Infectious Agent:	Togavirus
Vector/Vehicle:	A. africanus, A. simpsoni, Aedes aegyptium mosquitoes
Host:	None
Reservoir:	Monkeys, mosquitoes
Symptoms:	Fever, headaches, backaches, vomiting, nose bleeds, blood in faeces, prostration, slowing pulse rate with fever, jaundice
Treatment:	None
Prevention	Immunization by vaccination, vector control, protective clothing, bed nets, insect repellents, recovery leads to immunity
Long Range Effects	Fatality among indigenous population of endemic regions is 5%. Among non-indigenous groups in epidemics, 50%



WORMS & WELLS

THE PROPER WAY TO CARE FOR YOUNG CHILDREN:

BREAST FEEDING:

In the first hour after birth the baby should be breast fed.

This is important as suckling increases the psychological bonding between mother and baby. Breast milk is the best food for babies as it has all the nutrients that the baby requires for a period of 4 - 6 years. At the early stage of life the suckling reflex and rooting reflex are very strong after which there is a phase of less vigorous response to the breast.

Breast milk is more easily and quickly digested and babies should therefore be breast fed on demand.

Babies should be breast fed exclusively up to the age 4 - 6 months. Supplementing breast milk leads to a reduction in suckling, hence reduction in the stimulation of milk supply.

Prelacteal feeds (any feed including water given to infants during the first few days after delivery) are unnecessary. These can cause the baby to be less hungry and therefore less eager to suck at the breast.

The sooner and more frequently the baby sucks at the breast, the sooner lactation will be established.

For the first few days the baby is expected to suck sufficiently enough to be able to get the important colostrum (yellowish milk), the ideal food for a newborn which contains antibodies against diseases.

For the first few days of life it is important to discourage the use of plain water, glucose water etc.

Nipple confusion should be discouraged. This is where at an early age the baby is given the prelacteal feeds using a bottle which may not only introduce infection, but may also lessen the baby's enthusiasm for the nipple and may prefer the teat to the nipple.

WEANING:

It is recommended that infants be introduced to semi-solid foods and fruits between the ages of four and six months.

CONCLUSION:

In conclusion for a mother to be able to have enough breast milk and be able to breast feed her baby well, she should have enough rest, good diet and hygiene during ante-natal period. During the lactating period the mother should take plenty of fluids and good diet, she should relax, breast feed frequently and actually want to breast feed.

The husband should be able to assist her by taking care of her and paying attention to her as well as loving her.

KENYA NATIONAL POLICY ON INFANT FEEDING PRACTICES

Every institution providing maternity facilities and care for newborn infants should:

1. **Encourage exclusive breast feeding of infants below 4 to 6 months**
2. **Help mothers initiate breast feeding within 1/2 an hour of birth**
3. **Not give any prelacteal feeds**
4. **Show mothers how to maintain lactation even if they should be separated from their infants**
5. **Practice rooming in**
6. **Encourage breast feeding on demand**
7. **Not give infants any foods in addition to breast milk before 4 months**
8. **Encourage mothers to breast feed for at least 24 months**
9. **Inform all pregnant and lactating mothers of the benefits, and management, of breast feeding**

10. **Support breast feeding efforts of postpartum mothers**
11. **Foster the establishment of breast feeding support groups**
12. **Not accept any free supplies of breast milk substitutes**
13. **Not allow any publicity by the manufacturers of breast milk substitutes**
14. **Not give artificial teats or dummies to breast feeding infants**

IMMUNIZATION:

What is immunity:

The immunity of an individual to a specified disease is his ability to resist the pathogenic effects of its causative organism. This depends upon his genetic inheritance, his age, his general health and his past experience of micro organisms. **Immunization** is therefore the artificial stimulation of specific resistance to infection.

There are 6 diseases against which the child should be immunized before the age of 1 year, namely:-

1. Tuberculosis (TB)
2. Poliomyelitis
3. Tetanus
4. Whooping cough
5. Diphtheria
6. Measles

The Kenya Expanded Programme on Immunization (KEPI) established in June 1980 aims at reducing the morbidity and mortality rates in Kenya.

The best way to care for children is to ensure that they get immunized at the right age. At birth the baby is immunized against Tuberculosis and gets the birth dose of Polio vaccine.

at 6 week 1st dose of Polio vaccine and is dose of Triple vaccine (Diphtheria, Pertussis, Tetanus)

at 10 weeks 2nd dose of Polio vaccine
2nd dose of DPT

at 14 weeks 3rd dose of Polio
3rd dose of DPT

at 9 months Measles vaccine

There is no contraindication to immunization, even if the child is sick it is safe to immunize the child.

CONTROL OF DIARRHOEAL DISEASE IN YOUNG CHILDREN

Diarrhoeal disease are one of the commonest causes of morbidity and mortality in Kenya. The main cause of death being dehydration. (rapid loss of body fluids and electrolytes) and others dysentery and malnutrition.

FACTORS ASSOCIATED WITH INCREASED TRANSMISSION - ENTERO-PATHOGENS

1. Inadequate water supply
2. Faecally contaminated water
3. Lack of sanitary facilities
4. Improper food preparation and its storage
5. Poor weaning practices e.g. bottle feeding (early cessation of breast feeding for bottle feeding)

SIGNS OF DEHYDRATION

1. Diarrhoea 4 - 10 times in 24 hours
2. Some vomiting
3. Sunken eyes
4. Sunken fontanelle
5. Skin pinch goes back very slowly
6. No urine for 6 - 8 hours
7. Thirst

MANAGEMENT OF DIARRHOEA

1. Give plenty of fluids to replace the lost fluids.
   -cereal gruel

-plain water

-oral rehydration salts (ORS)

-madafu water

-fresh juices

-breast milk

2. Give the child plenty of food during and after diarrhoea - small and light foods
3. Take the child to hospital if:-

-does not improve in 3 days

-passes many watery stools

-vomits repeatedly

-is very thirsty

-east or drinks poorly

-has a fever

-has blood in stool

PREVENTION OF DIARRHOEA

- Give breast milk for the first 4 - 6 months and continue to breast feed at least for a year
- Start supplementary foods at 4 - 6 months
- Give freshly prepared foods and clean drinking water
- Give milk and other fluids by cup and spoon instead of feeding bottle.
- Have all family members wash hands after going to the toilet and before preparing and eating food
- Have all family members use a latrine
- Put young children's stool in a latrine or bury it
- Have your child immunized against measles as soon as possible after 9 months of age

CONCLUSION:

In conclusion, a small family is easier to manage than a large family. Therefore let us plan our families to be able to have healthier children and a healthy nation.

LECTURE ON NUTRITION

What is nutrition?:

Nutrition is the study of the nature of food and what it does to the body. A living body need food to perform all of its vital functions e.g. locomotion, respiration, reproduction, growth etc.

What is Malnutrition?:

Malnutrition may be defined as a deficiency and/or excess of one or more food nutrients in the body. Malnutrition is therefore in two forms namely under-nutrition (deficiency) and over-nutrition (excess).

What causes malnutrition?:

Malnutrition is caused by:-

1. Diseases - e.g. measles, diarrhoea/vomiting
2. Lack of proper diet e.g. one the three food groups is missing.
3. Draughtiness, famine (njaa) through a natural disaster
4. Poverty and/or traditional believes
5. Ignorance - if mother is ignorant of balanced diet then automatically the child is going to suffer from malnutrition. She might be having the food but because she does not know to vary food, she will keep on giving one type of food all the time.

NOW WHAT DO YOU DO TO PREVENT ALL THESE PROBLEMS:-

GO TO GROUPS AND DISCUSS

PREVENTION OF MALNUTRITION:

1. Immunization - to prevent diseases
2. Good environmental sanitation
3. Balanced diet
4. To prevent draughtiness by tree planting. People should be educated on the

importance of planting trees in their shambas to be able to have adequate rains.

5. Education - Mothers should be educated on the importance of taking children to child welfare clinics for education on various fields.

That is why Ministry of Health is taking the initiative of educating people through

1. Public Barazas
2. C. W. Clinics
3. Demonstrations
4. Folk Songs etc.

BALANCED DIET

INTRODUCTION:

Question 1. What constitutes your normal or staple diet?

Question 2. How many meals do you and your family normally have in a day?

FOOD SUPPLY

Availability of foodstuffs such as Maize, Cassava, Millet, Sorghum, Beans, Peas, Fish, Meat, Bananas, Vegetables, Fruits, etc. is necessary for the sustainability of human health. Without adequate food supply human health may deteriorate drastically.

NUTRITION:

Nutrition may be defined as the scientific study of how the body of a living organism is fed, i.e nourished. A body may be either well fed or poorly fed. A poorly fed body is said to be malnourished i.e malnutrition.

BALANCED DIET

A balanced diet may be defined as one that constitutes of all the 3 classes of foods in their correct amounts, i.e carbohydrates, proteins and vitamins.

CLASSES OF FOOD

Foods are broadly classified into three (3) main classes, vis, i) Carbohydrates These are energy-giving foods, e.g cereals, bananas, cassava, potatoes, wheat,rice, etc. They supply the body with energy which is needed for various body functions. Excess carbohydrates in the body (glucose) is converted into fats. Fats and oil are therefore in this class of foods.

ii) Proteins

These are body building foods. They replace worn outs parts of the body (tissue repair) and facilitate body growth (tissue growth). In the event of excessive starvation, i.e lack of carbohydrates in the body, excess proteins are converted into energy-giving foods proteins have a high calorific value when broken down to release energy. Examples of protein foods are meat, fish, eggs, beans peas, milk, etc.

iii) VITAMINS

These are protective foods. They protect the body against infection (diseases). Examples of protective foods are green vegetables and fruits.

COMMON NUTRITIONAL PROBLEMS

There are numerous nutritional problems but for the purpose of this lesson we shall limit ourselves to the following:-

i) KWASHIORKOR

The name kwashiorkor was initially derived from the Ghanaian word meaning the disease that affects a child when the new baby comes.

Kwashiorkor is a nutritional condition which affects mostly children below 5 years of age. The condition is due to child not getting adequate proteins (building foods) in his/her diet. The condition is characterised by:

- swollen checks
- mournful face
- swollen or oedematous joints
- apathy (lack of interest in the surrounding)
- stunted growth
- brownish/yellowish hair

PREVENTION

Provision of a balanced diet. Adequate proteins in the diet. Avoid diarrhoeal diseases infection.

ii) MARASMUS

Marasmus is a nutritional condition which mostly children under 5 years of age. The condition is due to a child not getting enough (adequate) food.
The child is starved because he/she doesn't get enough food requirements for the body.

Marasmus is characterised by:

- old man's look (wrinkled face)
- easily irritated (irritable)
- wasted body (emaciated)
- active look
- good appetite
- loose skin

PREVENTION

Provision of adequate and varied food supply to children. Avoid diarrhoea and helminthic (worm infection) diseases.

N.B. At times a child may suffer from both kwashiorkor and marasmus at the same time (simultaneously). This condition is referred to as kwash-marasmus. Control in this case is to give enough or adequate balanced diet to the child. It can also be called protein-energy malnutrition (PEM).

CAUSES OF MALNUTRITION

Causes of malnutrition with regard to kwashiorkor and marasmus are numerous depending on geographical, educational, social and administrative factors. However, for Kilifi the following could serve as possible causes.

- ignorance about balanced diet
- poverty
- cultural beliefs and taboos
- low educational levels
- poor agricultural practices
- high diarrhoeal and intestinal worms infections
- poor eating habits

PREVENTION OF MALNUTRITION

Strategies for the prevention and/or control of malnutrition may be intervened at two levels, i.e at family level and national level.

1. At family level

Individuals or members in a family should be actively involved in the practical activities aimed at promoting the nutritional status of the family members through:-

- adequate food production
- proper education on balanced diet
- health education on hygiene and sanitation
- good eating habits
- critical appraisal of cultural beliefs and taboos
- venturing into higher economic activities
- proper child care

2. At National level

A nation is made up of families and individuals. The nutritional status of families determine that of the nation. Alternatively national policies too affect or determine the nutritional status of families and individuals. A nation can improve the nutritional status of its people through:-

- formulation and implementation of proper food policies
- formation and implementation of nutritional strategies
- formation and implementation of nutrition health education strategies
- provision of nutrition demonstration centres
- provision of self-help income-generating activities.

COMMUNITY PARTICIPATION

Participation and Community

Community participation is a very fashionable phrase. It is being used very often nowadays, but community participation is a term that is often not understood very well. Although everyone talks about it, community participation is often not put into practice. Participation means joining with others to do something. The word is not used to describe someone working alone. The word "participate" means that more than one person is involved in doing something. The word "community" comes from the word "common". A community is a group of people that has something in common, such as the place they live, the tribe or clan they belong to, the work they do. People can live close together but be divided in interests and share little in common.

Community Participation

Community participation describes a situation in which the people who consider themselves members of the same community join to do something for the community. Community participation in development projects refer to a situation in which as many members of a community are actively involved in planning, carrying out, and evaluating the actions that the community is taking to solve its problems.

Community participation in developing a project does not mean that the project will not have problems. The solutions chosen by many people in the community are usually better that those chosen by just a few. Most important, experience in community participation makes the community more able to solve its own problems in the future. The Community no longer has to depend on someone from outside to help it look at its problems and do something about them.

The ways in which members of a community can participate or work together are many. Some communities rely on traditional leaders, such as a council of elders or a

chief to make decisions for them. Others organize new means of making decisions, such as village development committees or village health committees. Still other communities prefer not to develop a new organization but instead work through existing family and neighbourhood groups.

For community participation to work, the way it is organized must fit in with the wishes and **capabilities** of the community. Where possible, rather than creating something new, community participation should be adapted to the organization that already make decisions for the community. In development projects in many countries, it is common for field workers from outside the community to help the community participate in all stages of project development.

Top-Down Approach

One way of defining community participation is to compare it with other approaches that do not involve participation. The traditional approach in any community is for the decisions to be made by senior persons in the organization - the so-called "experts". The planners make the decisions and decide the priorities. This approach is sometimes called the "top-down" approach and contrast with the "bottom-up" approach where members of the community make the decisions.

Professional Dominance

This approach of leaving decisions to professional persons is also used by many educators. Many services have specialist design sections to plan and implement education programmes. The content is chosen by the educators based on defined needs.

In the traditional approach research is often carried out through surveys to find out what the community thinks and believe to be the problem. In the end it is usually the educator who makes the decision on what goes into the programmes.

Indoctrination

Traditional education is often indoctrination. Indoctrination is the process of telling people what to do. We make the decisions and expect them to be followed.

Just because a meeting is held by planners out in a community does not mean that there is community participation. You need to look carefully to find out what is really going on. Are the planners using it just to tell the villagers what to do? Or have they come to consult the people and give them a say in their future?

Self-help

The term community participation is often applied to programmes where self-help labour is used. The community may contribute their labour to dig a latrine for the school in their village. Is this genuine participation? Are they doing it because they have been told to do it? Or did they decide themselves to do it?

Spectrum of participation

When we carefully examine different interpretations of the word community participation we find that it is used to cover a whole range of very different actions along a ladder of participation:

manipulation		token power only to community
consultation		
community control		complete power to make decisions given to community

At one extreme there are actions that are really forms of manipulation.
Manipulation is when someone tries to have a hand in the decisions somebody else is making.

Total participation

At the opposite extreme there is total participation or complete control of their affairs by the community. For example we may give the local community control over the health budget for a locality. They may run the health clinic and make important decisions.

Consultation

Between these two extremes are a range of other activities that might sometimes happen. One common activity is consultation or asking a community's opinion. Holding a meeting to ask people's opinions is a very limited form of participation if the final decisions are made by outsiders.

How can we begin to look at community participation? We can ask several basic questions.

1. Who has been participating? Men, women; old, young; different tribal, clan, or religious groups; traditional-minded, modern-minded people? Who is being left out?
2. What has participation been about? Water supply and Sanitation, primary health care, agriculture, integrated rural development, etc?
3. How has the participation been organized? Does the participation come immediately from the community members or does someone from outside the community have to get it started? If assistance is coming from outside the community who is responsible and how is the assistance being organized?

Benefits of community participation

The benefits of community participation can be summarised as:

Community Participation

emphasises community rather than individuals

makes programmes relevant to local situation

ensures community motivation and support

improves take-up of services

promotes self-help and self-reliance

improves communication between community workers and community

enables the development of primary health care

A Working Definition of Community Participation in the Context of Hygiene Education.

Looking at what has been said so far, we can come to a definition of "Community Participation" for use:

1. We can influence the amount and type of community participation in planning, carrying out, and maintaining water supply and sanitation projects. We can promote it by making things easier, organizing groups, and training community members.

2. Participation means involvement by the community in all aspects of the development of a project, from its very beginning to its very end. Providing materials and labour is not all there is too community participation.

3. Through community participation, we not only end up with water supplies, latrines, and improved health behaviour, we also end up with communities more capable of solving problems for themselves. We end up with communities that are less dependent on outsiders and the government.

4. When talking about community participation, we need to ask three basic questions: who is participating, what are they participating for, and how is the participation being organized?

5. The ultimate aim of community participation in the context of hygiene education is sustainability of the water system. The goal is the system's proper use, efficient participation, efficient maintenance, and effective management with minimum outside assistance.

INTRODUCTION TO V.I.P. CONSTRUCTION

WHAT JUSTIFIES THE CONSTRUCTION OF LATRINE SYSTEMS?

DISEASES:

Various diseases affect people as a result of poor wastes disposal methods.

Disease infection results in the following ways.

1. From taking food or drink contaminated with faeces
2. From eating beef or pork infected with tape worms
3. From contact with contaminated water
4. From contact with contaminated soil
5. Via insect vectors.

CONCLUSION:

There are no short cuts to improved public health. The lasting results can only be achieved with the general introduction of satisfactory water supply and waste disposal systems, together with intensive health hygiene education.

FACTORS LEADING TO POOR WASTES DISPOSAL METHODS

Human, Environmental and Technical

1. **Human Factors**

   Cultural beliefs and economic status all fall under human factors.

   i) **Cultural beliefs**

   Certain cultures have taboos surrounding defecation practises. For example: where a Father in Law should never use the same latrine with a daughter in law, men and women may not be allowed to share the same toilet, others believe that evil spirits live in pit latrines etc.

Instead such people would prefer defecating out in the bush.

ii) **Economic Status**

This can also determine ones ability to construct a latrine system bearing in mind that any latrine system require some resources to construct.

iii) **Technical Factor**

Poor methods of constructing latrines led to pits collapsing. Pits were not dug properly, no pit linings were used, instead wooden logs that deteriorated easily by bacterial action and ants could not last long. Lack of maintenance also reduced the lifespan of the latrines and encouraged foul smells and flies. This act discouraged people from using their latrines.

CHOICE OF A SUITABLE LATRINE SYSTEM

Culture, Religion, Space and the condition of the ground can all determine the type of latrine system to be used.

1. **CULTURE**: (Pour flush or drop system?)

   -Pour Flush latrines can only be used with water while the drop pit system can be used where there is no water, needed for anal cleaning. Some cultures can only use water for their anal cleansing while others cannot instead they use paper, cobs etc.

2. **RELIGION**

   Some Religions also lay strict rules for used latrines and cleaning materials after defecation.

3. **SPACE:** (How much land do you Have?)

   Urban centres have very little space for building latrines. V.I.P. Latrines may not be very suitable here instead, Twin Compost pit latrines may be applied.

4. **CONDITION OF GROUND:** (How deep is the water table? How hard is the ground)

   Very high water table and rocky ground conditions are not suitable for pit

latrines. Pollution risk is pretty high on high water table grounds. On Rocky grounds, excavating pits may be too expensive hence other alternatives may be used such as the compost latrines.

FACTORS THAT DETERMINE THE LOCATION OF LATRINE SITES

1. The distance from dwelling houses to the latrine must not be less than 6 metres or more that 30 m away
2. The distance from the latrine to any water source (for example: a stream, river, a well, spring, bore hole etc) must not be less than 30 metres away.
3. The latrine must be sited in such a way that in all seasons the wind direction should never be navigated towards the dwelling houses, so as to avoid the amusing foul smells.

THE V.I.P. COMPONENTS

The V.I.P. latrine consists of the Pit, the Squatting Slab, the Pit Lining, the Shelter, the Vent Pipe and the Fly Screen.

1. **THE PIT**

   The pit receives and stores excreta safely. The excavated pit must always be very plumb and no excavations should be done beneath the pit lining. Depending on the shape of the slab desired a pit can either be circular or rectangular.

2. **THE SQUATTING SLAB**

   A squatting slab can either be circular or rectangular. The size of KIWASAPs Circular slabs is 1240 mm diameter while Rectangular slab measures 1240 x 850 mm^2. A slab comprises of a Squat hole, Vent hole and Foot Rests. The slab is usually placed on a pit lining. Slabs are constructed by concrete reinforced with either weld mesh, round bars, BRC, etc. concrete ratios are 1

part of Cement; 2 parts of Sand and 3 parts of Ballast. The slab is cured (kept moist) with water for at least 14 days from the second day of construction.

3. **PIT LININGS**

This is a wall built on the upper part of the pit in which loose soils exist. Pit linings prevent heaving of these loose soils. Pit lining can be constructed using either stabilised soil blocks, coral blocks, cement mortar plaster, bamboo, etc. However durable materials must always be used. Jointing Mortar is used for joinery, i.e. 1 part cement and 5 parts sand.

In firm grounds a pit lining of only 1 meter depth is sufficient, but in loose soils, pit linings can be built through out the total depth of the pit but perforations are provided to allow seepage of fluids through the lining walls.

4. **THE SHELTER**

The purpose of the shelter is to provide privacy to the user and also prevent direct light to the Squat Hole. The shelter comprises of the walling, doors, and the Roof. Any local common building Habits and Materials can be applied to set up the shelter, Spiral shelters are designed in a manner that doors are not necessary.

5. **VENT PIPES**

The purpose of the Vent Pipe is to remove foul smells and control flies. Fresh air enters through the Squat hole and displaces foul smells that are then emitted out through the vent pipe. Flies in the pit are always attracted by light through the vent pipe while escaping. P.V.C. pipes, brick work, asbestos pipes etc can be used as vents (minimum diameter should be 100 mm)

6. **FLY SCREEN:**

The purpose of the Fly Screen is to trap the flies escaping through the vent pipe, It is normally fixed at the top most part of the Vent Pipe.

The Fly Screen also prevents flies from outside from entering into the pit through the Vent Pipe.

Mosquito Gauze with 2 mm span is used as fly screen.

PLACING OF VIP-LATRINES

1. Placing of VIP-Latrines

It is very important to choose the best site for constructing our VIP's otherwise:

(a) One may be afraid to use the VIP latrine if it is constructed far from home,

(b) Water in near by source may be polluted by the latrine,

(c) If too near the home, the seepage might affect the building foundations of our houses,

(d) The direction of wind might force the smells from vent pipes to our homes etc.

Hence the correct position for siting a VIP-Latrine is as follows:

I. The VIP latrine should be at least 30 metres away from a dam, river, borehole, well or any other ground water source.

II. The VIP should be at least 6 metres away from a dwelling house, but not so far that they are scared to make use of the VIP during the night.

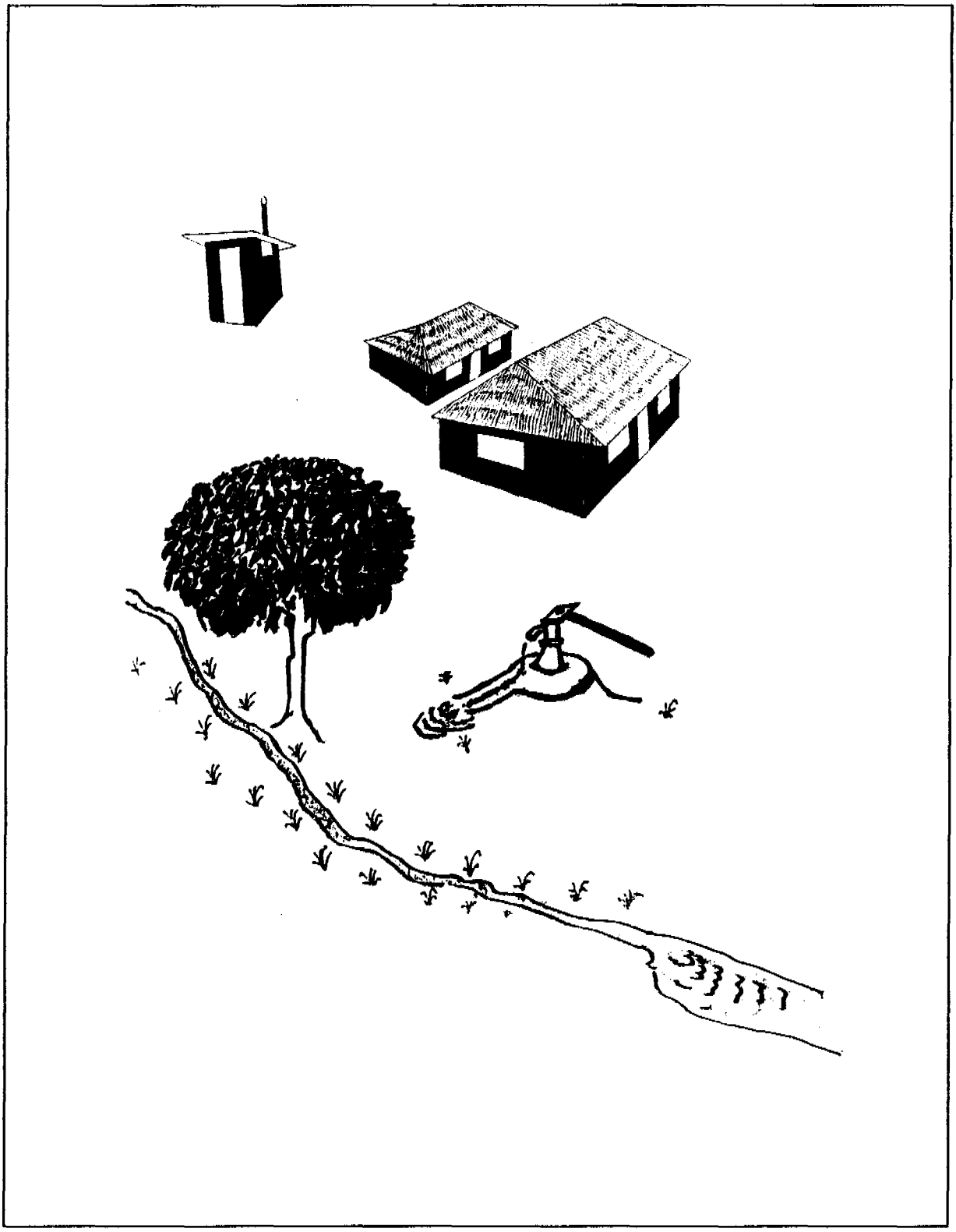
III. The VIP should at least be within 3 metres inside your boundary.

IV. The vent pipe should be exposed to sunlight.

V. The site should have a free movement of winds.

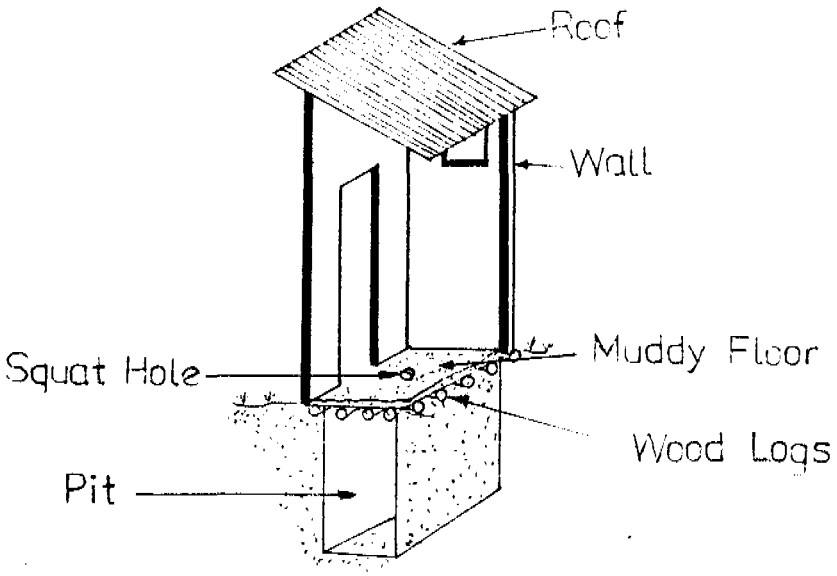
Part IV and V will help the vent pipe to function properly.

THE IDEAL LOCATION FOR A PIT LATRINE

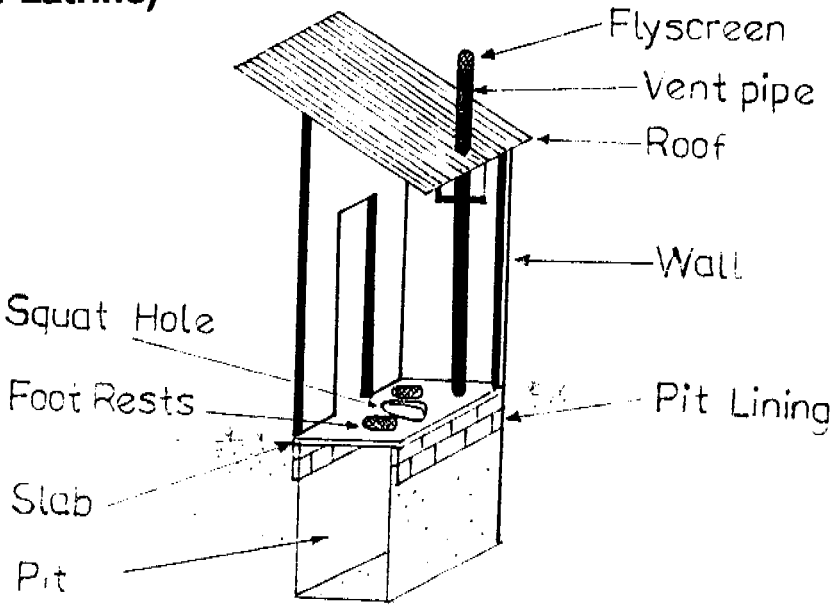


THE COMPONENTS OF A VIP (HAND OUT)

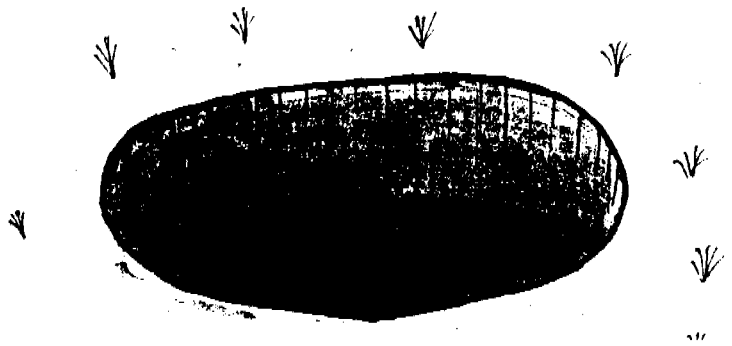
ORDINARY LATRINE



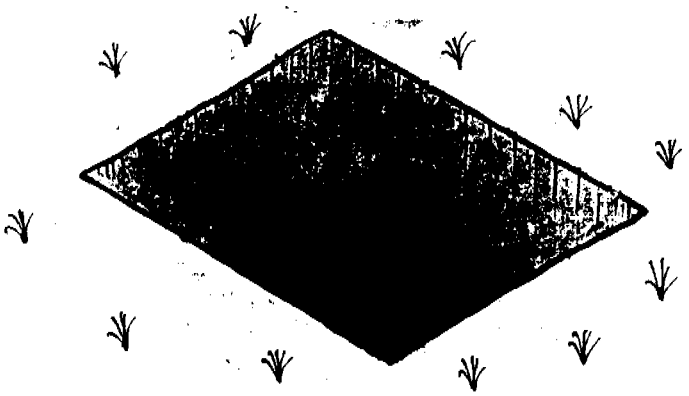
VIP (Modern Latrine)



TYPES OF PITS

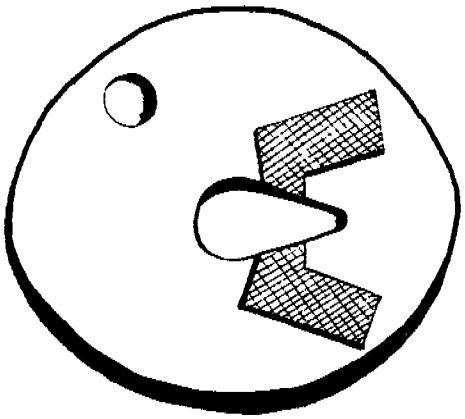


CIRCULAR

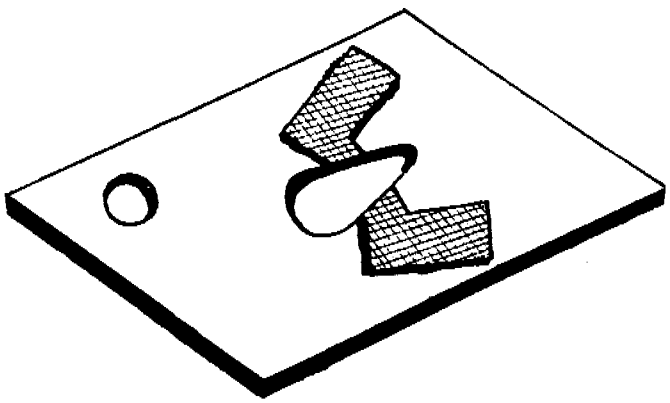


RECTANGULAR

TYPES OF SQUATTING SLABS



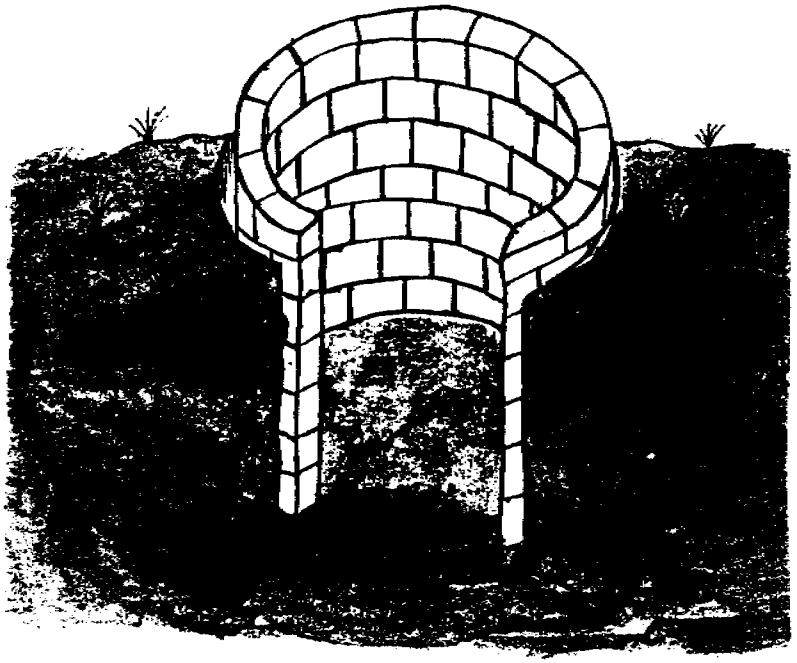
CIRCULAR SLAB



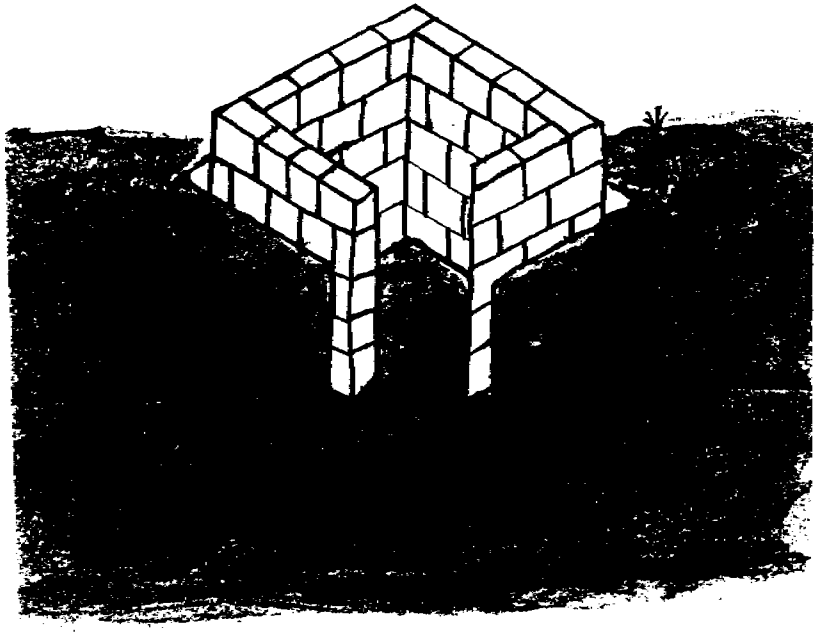
RECTANGULAR SLAB

VENT PIPE AND FLY SCREEN

PIT LININGS

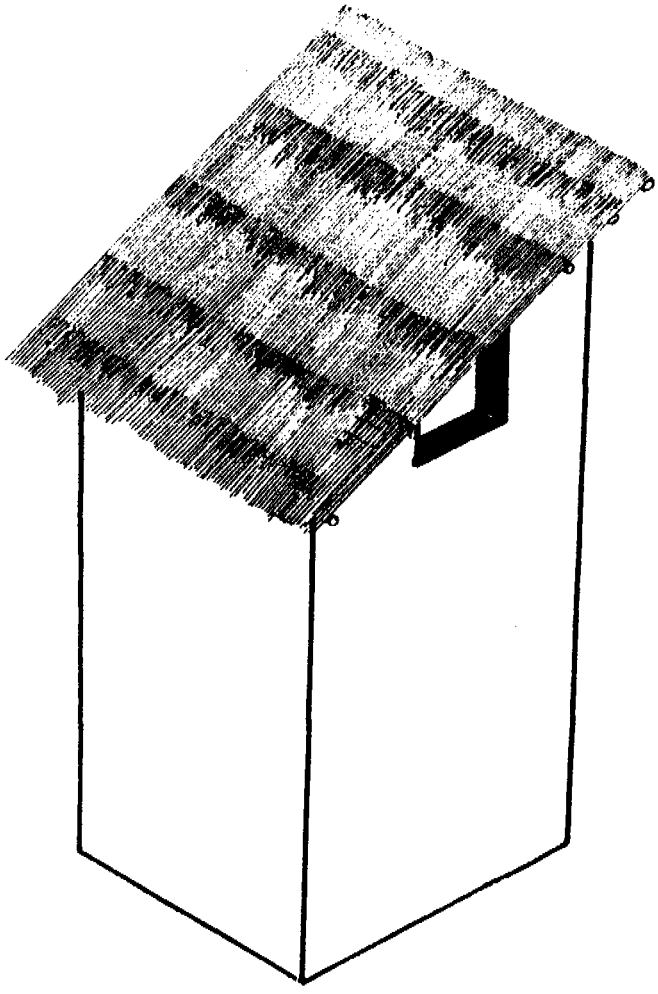


CIRCULAR

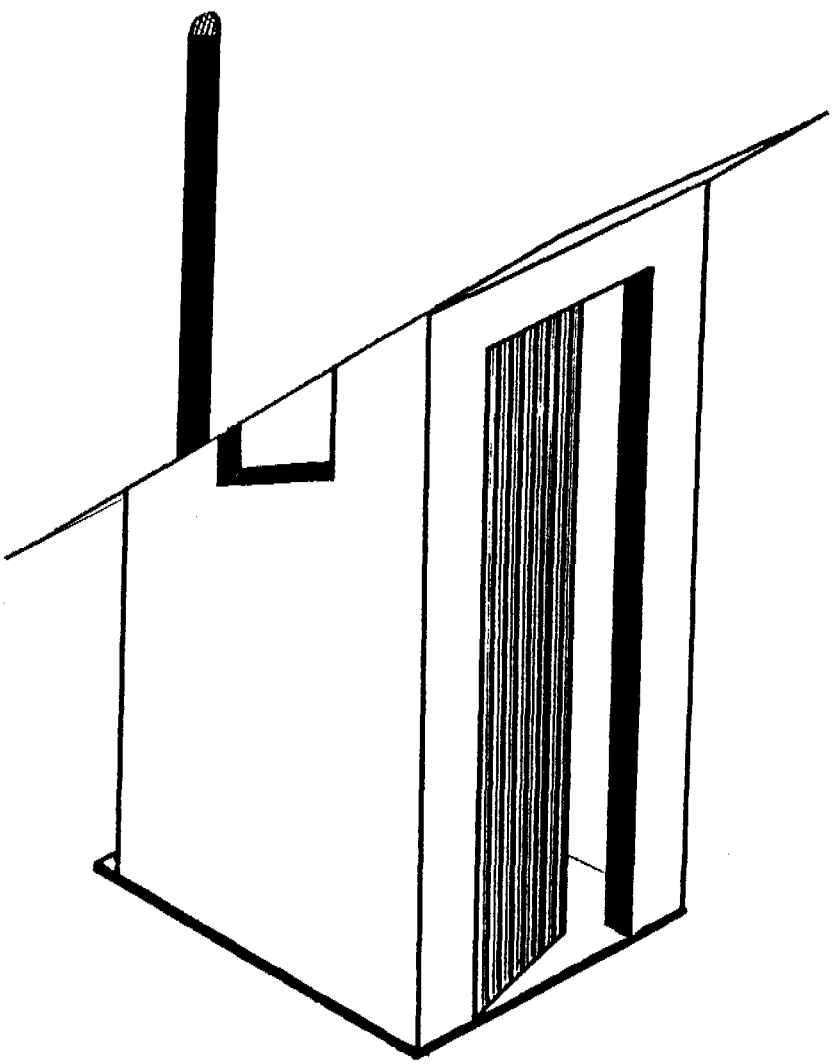


RECTANGULAR

TRADITIONAL PIT LATRINE



MODERN V.I.P. LATRINE



CALCULATIONS VIP-LATRINES

How to calculate the effective pit volume

VIP latrine pits need some free space (0.5 m) left at the top which is always empty. The "effective volume" of the pit is the volume below this, which is used to store the faecal solids which accumulate with time. The effective pit volume (m^3 is the product:

(No. of users) X (Solids accumulation rate in m^3/person/year) X (pit design life in Year)

Solids accumulation rate

The rate at which the solids accumulate in pits depends on whether the pit is "wet" or dry (ie whether it penetrates the groundwater table or not).

Traditional design values (dating from work in the 1950's and earlier) are:

0.04 m^3/person/year in wet pits, and

0.06 m^3/person/year in dry pits

with these values being increased by 50% where bulky anal cleansing materials (eg corn cobs, cement bags, stones, mud balls) are used.

Recent work has shown that these values are too conservative. For Example:

a) Zimbabwe: 0.04 m^3/person/year in dry pits
0.02 m^3/person/year in wet pits (and in dry pits if "bucket" showers are taken in the superstructure)

b) Ghana 0.04 m^3/person/year in dry pits
0.03 m^3/person/year in wet pits

Pit design life

For non-emptiable, single-pit VIP latrines this should be at least 10 years.

For emptiable, single-pit and alternating twin-pit latrines this should be at least 2 years. The actual emptying cycle will depend on the cost of emptying and the cost of construction: designers should seek to optimize the combination of pit volume and pit emptying frequency so as to produce the least cost solution.

PRACTICAL ON V.I.P. LATRINE CONSTRUCTION

A) Setting out of Pits

i) Circular pits

ii) Rectangular Pits

B) Setting out Pit Linings

i) Circular Pits

ii) Rectangular pits

A) SETTING OUT OF PITS

Brief Notes:

The initial dimensions of the pit must be wider by at least 150 mm than the slab dimensions. The Circular slab has a diameter of 1240 mm while the Rectangular slab has a diameter of 1240 x 850 mm. Hence the measurements for setting out of pits are as follows:-

i) Circular Pits = 1500 mm diameter

ii) Rectangular slab = 1500 x 1100 mm diameter

The pits is set out with a slightly wider diameter so as to accommodate the pit lining walls to be built on the upper part of the pit.

After setting out of the pit, pit digging is carried out up to the desired lining walls Foundation level, where stable ground has been reached. Once this level has been reached, the pit digging is stopped for a while until the building of the lining walls has been carried out and completed.

Always care must be taken to ensure that digging is done perpendicularly and accurately.

Before setting out of pits has been carried out, it is assumed that the spot had earlier been located accurately, in terms of the distances from the site or spot to the dwelling houses, existing water sources and direction of wind. Obstacles of wind should also be considered for a good effectiveness of vent -pipes.

i) CIRCULAR PIT

SETTING OUT STEPS:

1. Take a string of about 1600 mm and fold it into two making the two loose ends meet.
2. From the folded end, measure 750 mm towards the loose ends and mark on the string using a pen.
3. Make a knot on the mark established.
4. Fix a peg on the sited ground
5. Fix the string on the peg

   -Hold a stick with your right hand and fix the stick on one side of the string

on the peg and straighten it.

6. Draw a circle on the ground using the stick on your right hand
   -The string will help to guide you while drawing the circle around the peg
   -The diameter will eventually automatically be established with a measurement of 1500 mm

ii) **RECTANGULAR PIT**

SETTING OUT STEPS:

1. Fix 2 pegs on the ground at an interval of 1500 mm apart. Tie a string from peg **A** to peg **B**.
   NB: To obtain a 90° degree Angle, two methods can be applied:
   1) use of a T. Square
   2) Pythagorean method (3-4-5- method)
   The (3-4-5-) method is more practical, cheaper to devise and simpler.
2. Take a string that measures about 1300 mm long from one loose end, measure about 50 mm and put a mark on the string. This is the 1st mark.
   - Measure another 300 mm from the first mark and put a 2nd mark
   - From the send mark, measure another 400 mm and obtain the 3rd mark
   - From the 3rd mark on same string, measure 500 mm and fix the 4th mark
3. Join the first mark and the fourth mark (1st and 4th mark) together and obtain a point **(K)**. tied on a knot.
   NB: If pegs are fixed on the marks as shown on the sketch, and angle of 90° degrees will be established at point **B**.
4. Back to the pegs A and B established earlier, measure 300 mm from peg B towards peg A and fix a peg **(E)**.
5. Fix the pythagorean string on the pegs in a manner that the 300 mm part on the pythagorean string fits on the pegs (E) - B.
   -Hold a stick with your right hand and straighten the string towards point **C** until the stick comes in contact with 3rd mark on the pythagorean string. Fix a peg on the point and call it point **(F)**.

6. Tie a string or extend the string on pegs A - B, towards point C and measure exactly 1100 mm length and fix a peg at point C,
7. At peg C towards peg B measure 300 mm length and fix a peg **(G)**
8. Fix the Pythagorean string on the pegs ion a manner that the 300 mm part on the pythagorean string fits on pegs (h) - C.
   -Hold a stick with your right hand and straighten the pythagorean string towards point D, until the stick comes in contact with the 3rd mark on the pythagorean string. Fix a peg on the point and call it point **(J).**
9. Tie a string or extend the string A - B - C towards point D and measure exactly 1500 mm from peg C and fix a peg at point D.
10. Now join peg D and peg A with a string.

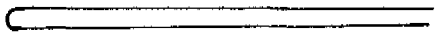
NB: If the whole exercise was carried out correctly, then the angle at peg D and peg A will automatically be a Right Angle i.e. 90° degrees.
To check for accuracy, measure and compare the diagonals AC and BD. If they have equal lengths, then all the angles are Right Angles or 90° degrees.

SKETCHES FOR SETTING OUT OF CIRCULAR PITS

STEPS

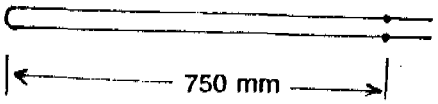
(1) String 1600 mm long

String folded into two



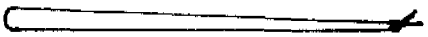
Loose ends

(2)



Mark with a pen

(3)

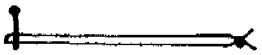


Tie a knot on the mark

(4)

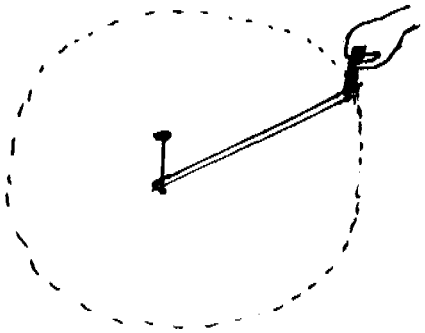
A peg on the ground

(5)



Fix the string on the peg

(6)



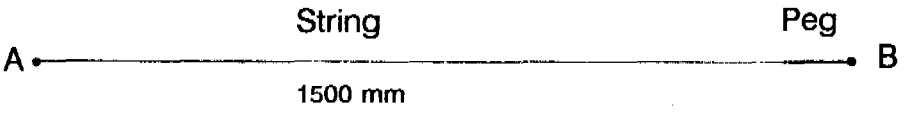
Hand with a stick drawing a circle

Once the circle is completed then the setting out of the circular pit is over. Excavation/pit digging can now take off immediately on the area enclosed by the established circle.

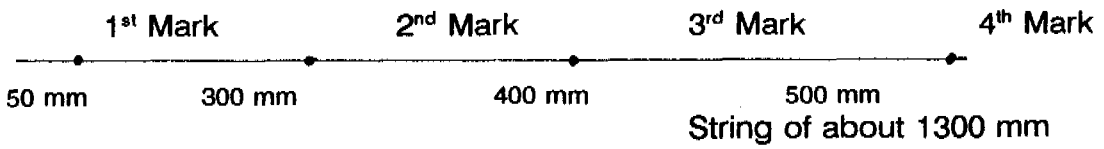
SKETCHES FOR SETTING OUT OF RECTANGULAR PITS

STEPS

(1)

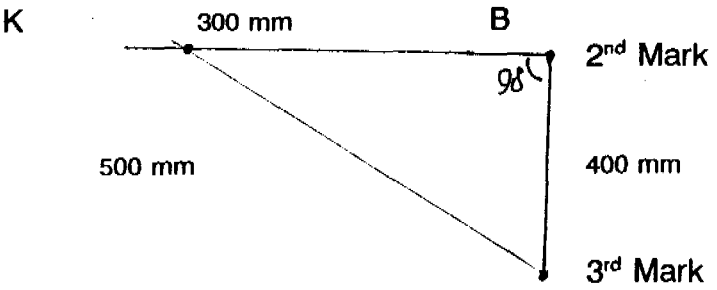


(2)



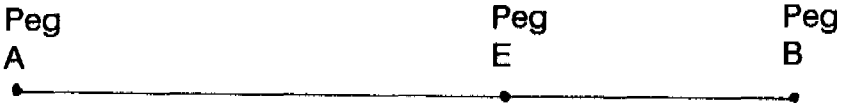
String of about 1300 mm length

(3) 1st and 4th mark joined

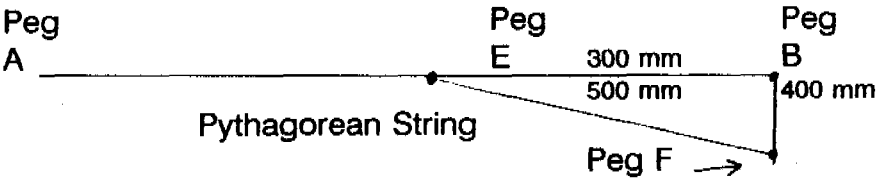


Pythagorean String 3 4 5 method ($3^2 + 4^2 = 5^2$)

(4)

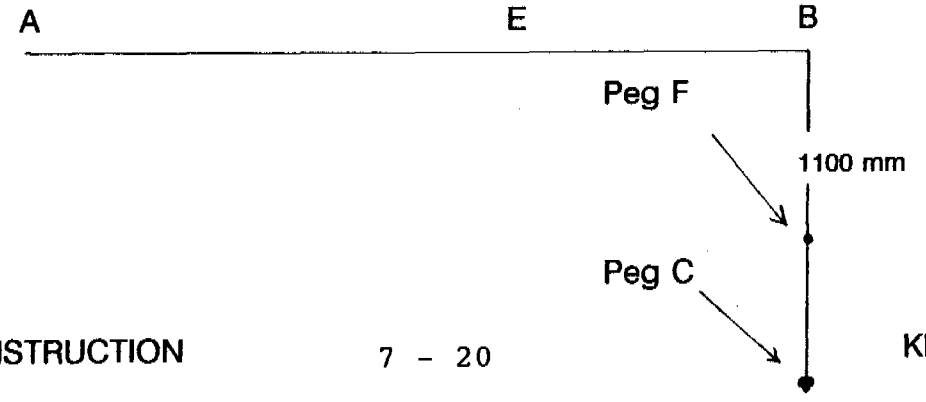


(5)



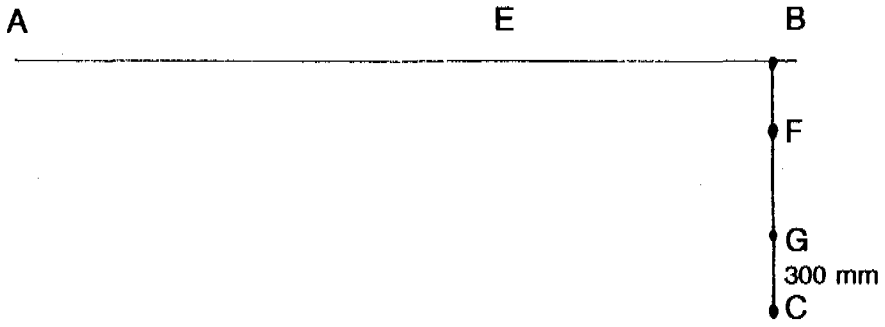
Towards C

(6)

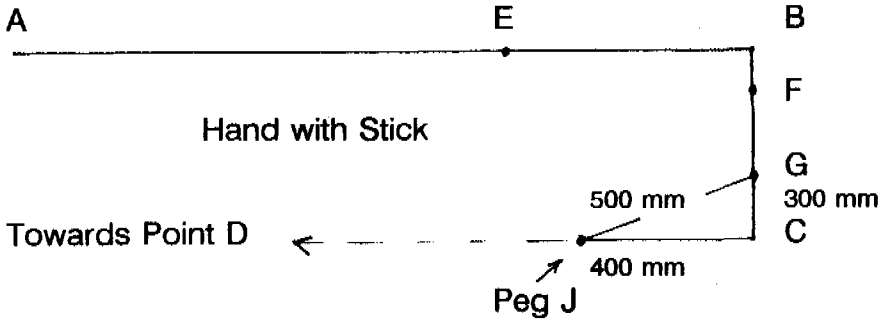


STEPS

(7)



(8)



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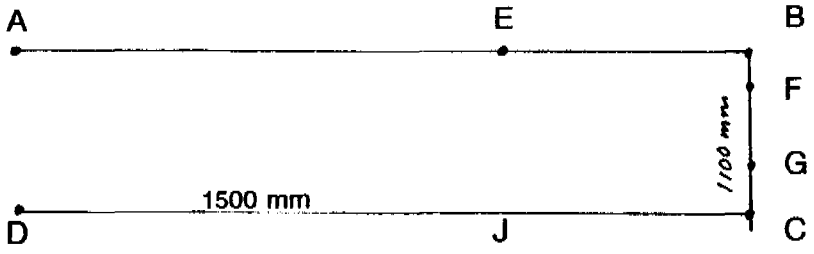
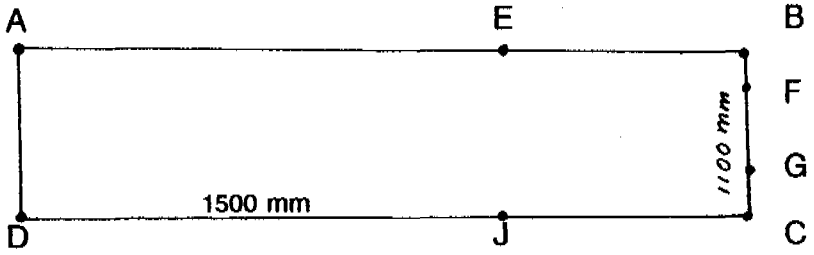


(10)

Join
A to D



All the angles have now been established and excavation/pit digging should start immediately.

B. SETTING OUT OF PIT LININGS

BRIEF NOTES:

The setting out of Pit Linings is done after the excavation of Pit has been carried out and the stable ground arrived at. The dimensions of Pit Linings must be smaller by at least 75 mm

Pit Lining setting dimensions are as follows:-

1) Circular Linings = 1040 mm diameter
2) Rectangular Linings = 1040 x 100 mm diameter

After the setting out has been done, lining walls are then built. A day after, pit excavation can be carried out.

The pit lining must be built with a height of about 150 mm above the ground level. This will later help in manoeuvring about the surface drainage system.

i) **CIRCULAR PIT LINING**

The steps are just the same as for Pit setting, only that a string of about 1200 mm is folded.

- From the folded end towards the loose ends measure 520 mm and mark and make a knot on the string.

ii) **RECTANGULAR PITS**

The steps are just the same as for setting up of Pits except that the measurements are slightly different:

from peg A - B = 1040 mm
B - C = 700 mm
C - D = 1040 mm
D - A = 700 mm

PREPARATION OF MOULDING BOXES

MATERIALS	
Planed Timber 6" x 1"	1 Metre
Nails 1 1/2"	1/4 kg
Hinges 2"	2 Pieces
Staple (small size)	1 Piece

TOOLS

- Claw Hammer
- Carpenters Saw

MOULDING BOX SIZE

For external walls mould s with wide width are made

For partitions moulding boxes with thinner widths are made

However, a moulding box 290 mm long, 140 mm wide and 115 mm high can be used to produce blocks that can be used to build bother external walls and partitioning walls

i.e. for external wall

290 mm = length

140 mm = width

115 mm = height

for Partitioning,

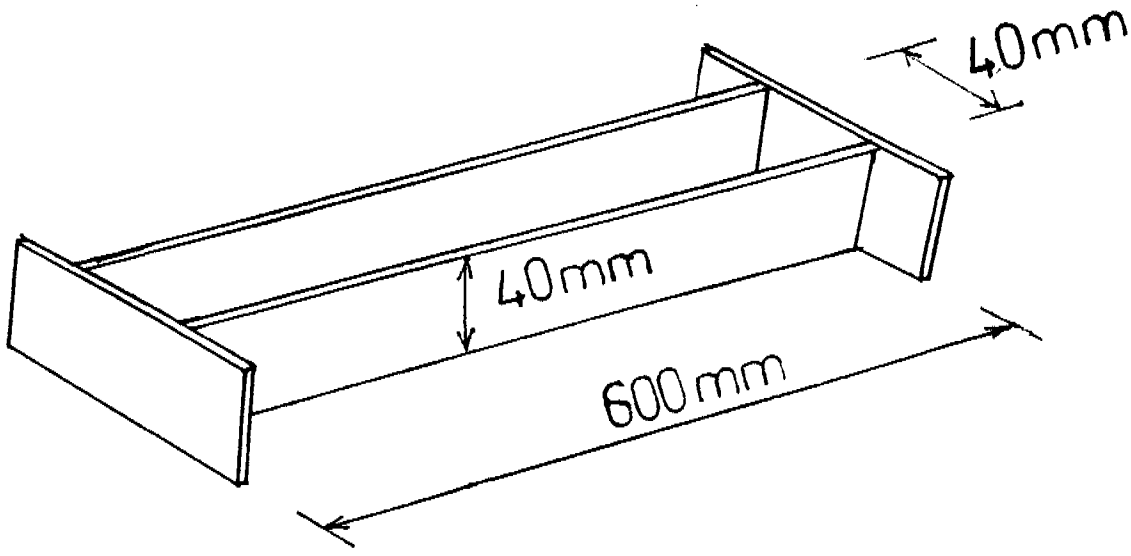
290 mm = length

140 mm = height

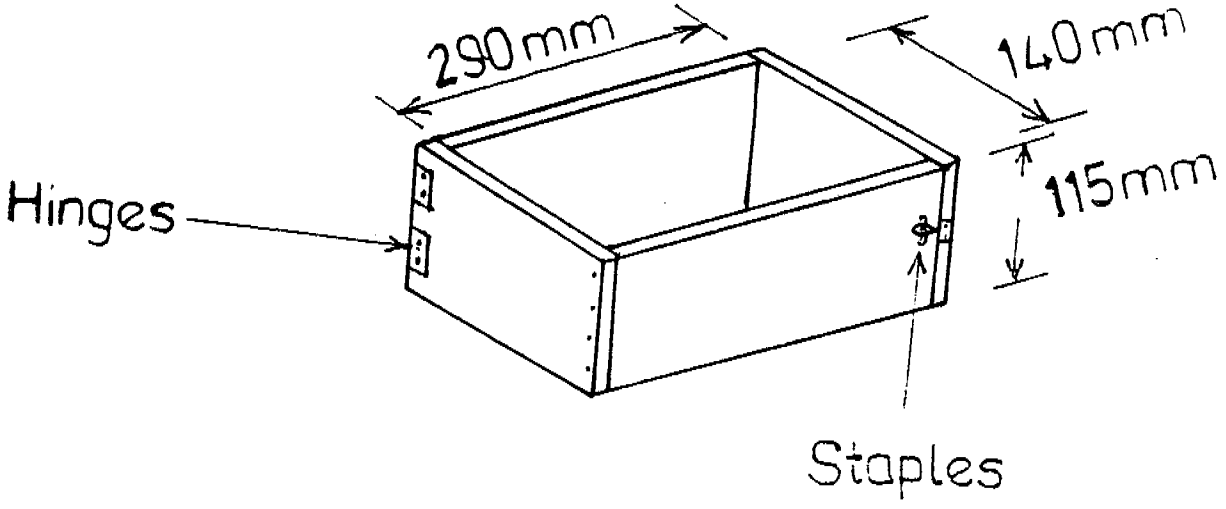
115 mm = width

WOODEN MOULDS

FOR SHRINKAGE TEST



FOR STABILISED SOIL BLOCKS



THE CORRECT WAY TO DETERMINE CEMENT : SOIL RATIO WHEN MAKING STABILISED SOIL BLOCKS

Stabilised Soil Blocks

Cement, as a stabiliser, is mixed with soil to form stabilised soil blocks. The amount of cement applied in soil is determined by the characteristics of the soil used.
A simple test should be carried out before any mixing is done. The test will enable us to choose a suitable soil and to determine the amount of cement required for the mix, in order to produce strong blocks.

Soil Shrinkage Test

STEPS

1. A wooden mould box measuring 40 mm x 40 mm x 600 mm is made
2. The mould box is then smeared with grease at the inner side.
3. Muddy soil free from humus or any debris is prepared, filled and compacted into the mould. Compaction should be even and the top part levelled.
4. The box is then put in the sun for 3 days or in shade for 7 days.
5. Shrinkage of this specimen is then measured.

Results/Observations

a) Shrinkage should not exceed 50 mm

b) Cracks on the surface should not exceed 6 in number.

SHRINKAGE TEST	CEMENT : SOIL RATIO
Up to 10 mm	1 : 15
Up to 20 mm	1 : 12
Up to 50 mm	1 : 9
Over 50 mm	Not suitable until more sand is added
NB: Ratio below 1 : 9 may prove to be uneconomical	

FABRICATION OF STABILISED BLOCKS

Stabilisation of soil is done so as to improve the soil by increasing its strength. It reduces the effect of rapid moisture change and the erosive effects of water on the soil surface.

Soil Preparation

STEPS

1. Surface soil should be excavated until stable ground free from debris or humus is obtained.
2. Lumps of soil should be sieved and removed or crushed.
3. Suitable soil/cement proportions should have been obtained in advance and tabulated.
4. Correct proportions of cement/soil are then mixed thoroughly and evenly using shovels.
5. Water is then added bit by bit until the required consistency limit is achieved.

Consistency Limit

To obtain the correct consistency limit, take a handful of mix and squeeze it on your palms.

Result

1. If water appears, then more of the dry cement/soil mix should be added.
2. If an easy consolidation is achieved with very little water observed, the mix has the right water content.

Causes of Weak Blocks

1. Poor ratio of cement/soil mixtures
2. Poor mixing of cement and soil
3. Inadequate compaction of mud into the moulding box
4. Improper curing.

Curing of Stabilized Soil Blocks

After the third day, the produced block should be cured by pouring water on them to keep them wet for 7 days. After 7 days curing, they should be kept in open air for at least 21 days before use.

Drop Test

a) A stabilised soil block is moulded with a desired ratio

b) The block is cured for 7 days and let to dry for three weeks

c) The block is then lifted from 1 metre height and dropped on the ground.

Results:

The block should not break in powdered form. Only two pieces and a few particles should be observed, if the soil was suitable.

SETTING OUT OF PIT LININGS

BRIEF NOTES:

The setting out of Pit Linings is done after the excavation of Pit has been carried out and the stable ground arrived at. The dimensions of Pit Linings must be smaller by at least 75 mm

Pit Lining setting dimensions are as follows:-

1) Circular Linings = 1040 mm diameter
2) Rectangular Linings = 1040 x 700 mm diameter

i) **CIRCULAR PIT LINING**

The steps are just the same as for Pit setting, only that a string of about 1200 mm is folded.

- From the folded end towards the loose ends measure 520 mm and mark and make a knot on the string.

ii) **RECTANGULAR PITS**

The steps are just the same as for setting up of Pits except that the measurements are slightly different:

from peg A - B = 1040 mm
B - C = 700 mm
C - D = 1040 mm
D - A = 700 mm

CONSTRUCTION OF PIT LININGS

Irrespective of what materials used; be it stones, stabilised soil blocks, bricks etc, the lining walls should be plumb (vertical) once constructed.

Pit lining wall are built along the edges set out for pit linings, towards the wall sides. If stabilised soil blocks or bricks are to be applied, then

(i) At least 50 mm thick cement mortar of mix 1:5 is spread along the edge set for the lining to the wall side.

(ii) Blocks are then laid along the edge with spacings about 20-30 mm from each block.

(iii) The spaces are then filled with cement mortar to join the blocks.

(iv) On the surface of the first layer, about 30 mm of cement mortar is spread along.

(v) The successive layer is then laid and joined.

NB A plumb bob should always be used to ensure that walls are vertical. Proper block laying procedure must be followed to ensure that vertical joints of one layer do not fall over or under the next layers joint directly.

INTRODUCTION TO THE VIP SHELTER:

A shelter comprises of a wall and a roof. Depending on the design a shelter can either have a door or built in a manner that a door may not be required (Spiral shaped). It can either be rectangular, circular or spiral.

The main functions of a shelter are:-

1) to provide privacy inside a toilet by the users
2) to protect the users from adverse weather
3) to help in controlling flies and other insects by avoiding direct light from entering through the squat hole

The most important factors in selecting the type ass shelters are:-

1) Local customs in relation to building habits
2) Personal preferences
3) Economic status (affordability)
4) Locally availably materials.

A shelter should have enough room for the user. The minimum dimensions for the room should be as follows:

a) Rectangular shelters - 1000 mm x 900 mm
b) Circular shelter - 900 mm diameter
   Heights for shelters differ with the nature of building materials used ie. Front wall - 2000 mm for mabati roof and 2100 mm for Makuti roof
c) Rear Wall = 1800 mm for both mabati and makuti roof

Depending on the availability of materials, shelters can be built by the following materials:

a) Walls - Mud and wattles (wooden vertical + cross poles), bamboo adobe or stabilised soil blocks, makuti etc.
b) Roof - Makuti, thatching grass, mabati, cement/sand tiles etc.

HOW TO CONSTRUCT A VIP SHELTER

CONSTRUCTION:

1) Walls:

Irrespective of what materials are used, walls should be plumb (vertical) when constructed. With stabilised soil blocks walls, the vertical joints of one layer should not fall over or under the next layers' vertical joint (see Sketch 5). The front walls must be higher than the rear walls to allow for a quick rain water runoff. Vents should be provided but light should not pass directly to the squat hole

2) Roof:

Roofs should be constructed properly to avoid leaking. No direct light should pass through the roof to the squat hole.

Following are the steps involved in the construction of rectangular shelters, build of Mud and Poles or Wattle:

STEP 1

Dig holes (big enough to allow the Poles to be inserted) around the sides of the pit lining at intervals of 200 mm centres, as shown on sketch 1. The holes should be dug at about 300 mm depth. Holes in the front should be fewer or closer so as to provide a space for a door of about 700 mm width.

STEP 2

Take 4 pieces of Poles 2400 mm long each. Pour a little ash into the holes and insert the pieces on the front side. Pour extra ash into the holes (the ash will help to put off ants). Compact the holes with soil or rubble stones, ensuring that the Poles are vertical/plumb by the use of a plumb line (a string fixed with a pebble on one end).

STEP 3

Take 4 pieces of poles 2100 mm long each to be inserted at the rear side. Repeat same process as in step 2 above.

STEP 4

Tie a string on each of the front corner poles and rear corner poles as shown on

sketch 2. Note the string will slant from the front poles to the rear poles

STEP 5

The string is then removed and the top part fixed with rafters. Rafters are fixed on the side poles and should extend by at least 300 mm on either front or rear sides for eave provision.

STEP 6

On the vertical poles tie horizontal poles in a manner that one piece lies in the inner side and the other lies on the outer sides, the vertical poles sandwiched in between them (as shown in sketch 3). The horizontal poles are then tied together to the vertical poles using sisal rope (or any other rope available). The horizontal poles are fixed at intervals of about 200 mm intervals.

STEP 7

On top of the rafters, the purlins are then laid across at 150 - 200 mm intervals and tied by a string.

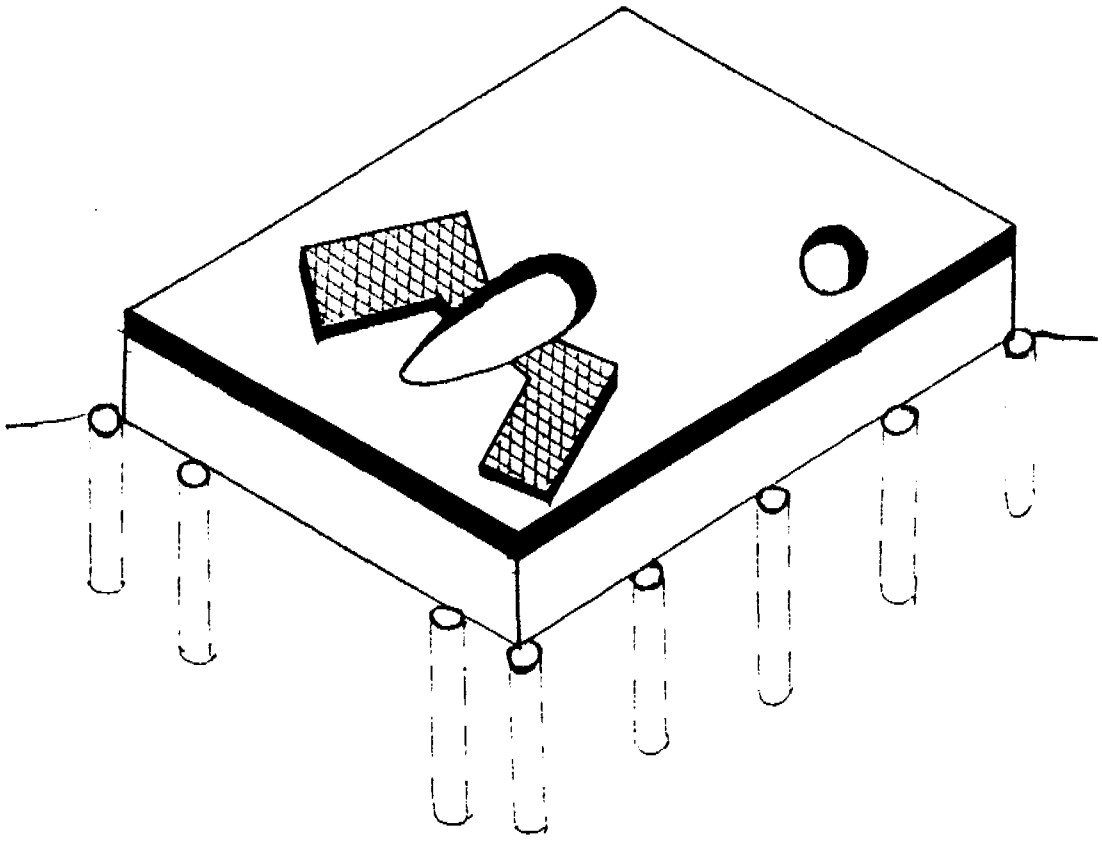
STEP 8

Thatching by either using makuti, grass, mabati etc can now proceed. Thatching materials are tied or fixed to the purlins.

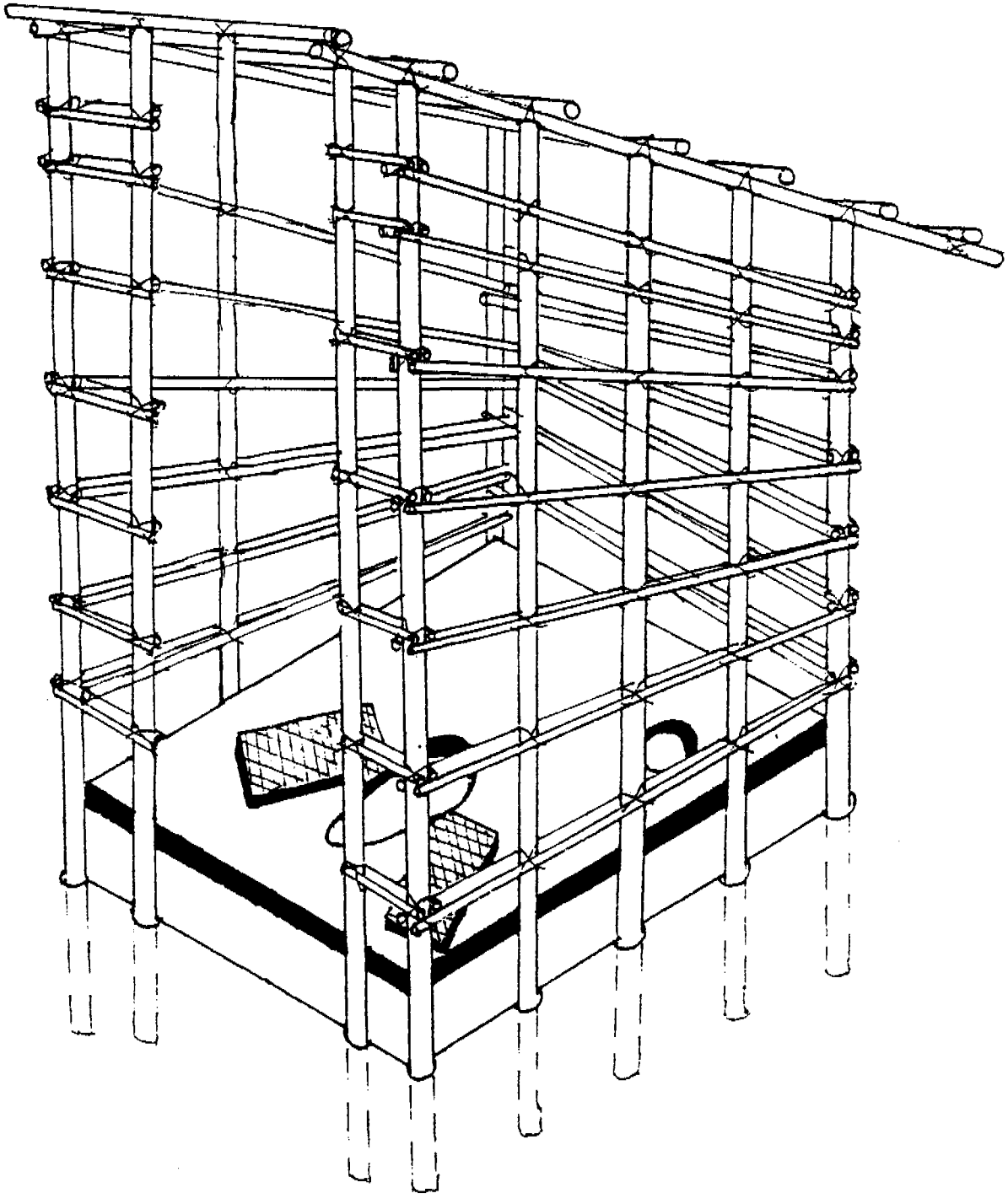
STEP 9

Once roofing or thatching is over, mud is prepared by mixing soil with water and mixed thoroughly until a plastic limit consistency is arrived at. The mud is now ready to be plastered or moulded within the pole framework

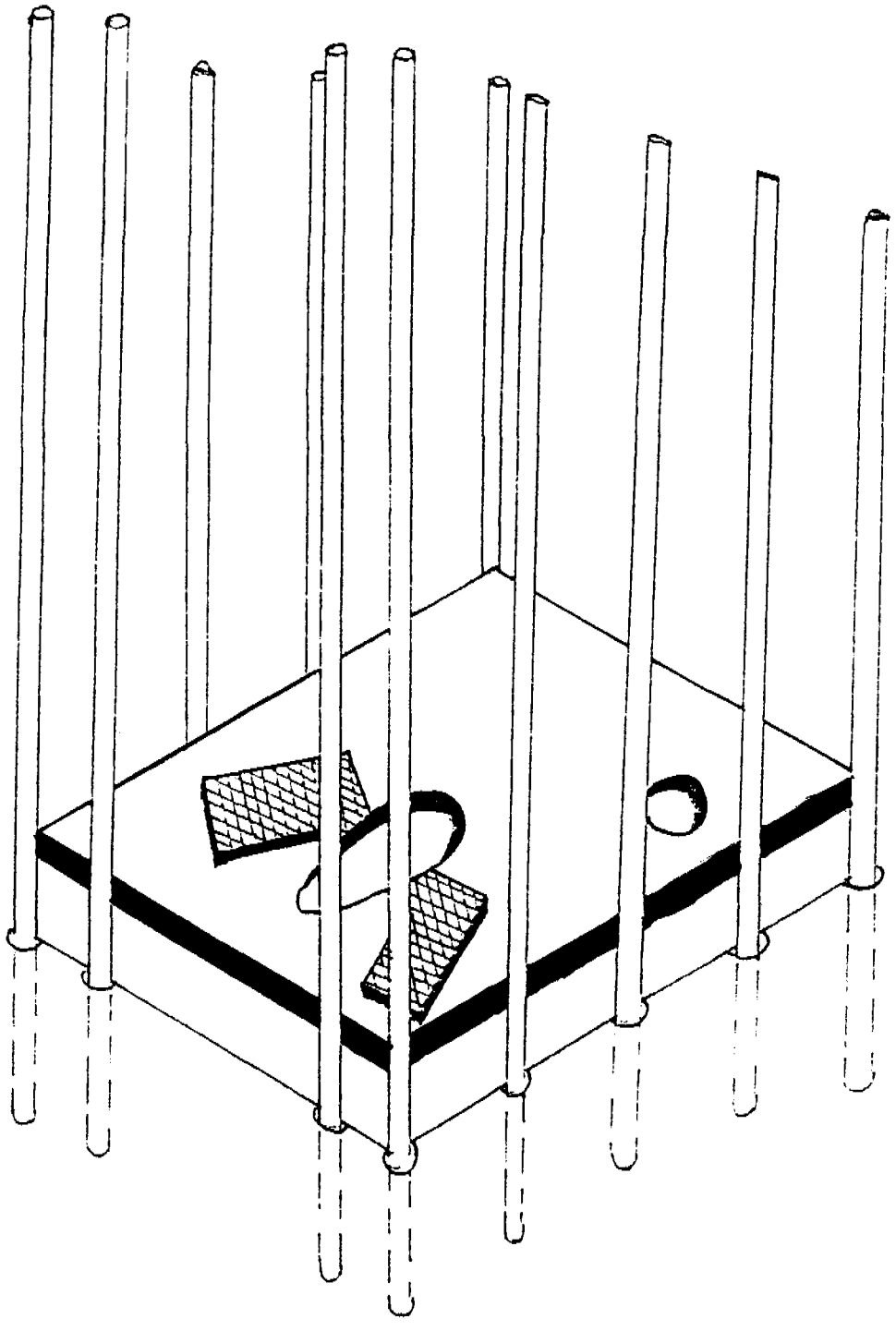
SKETCH 1

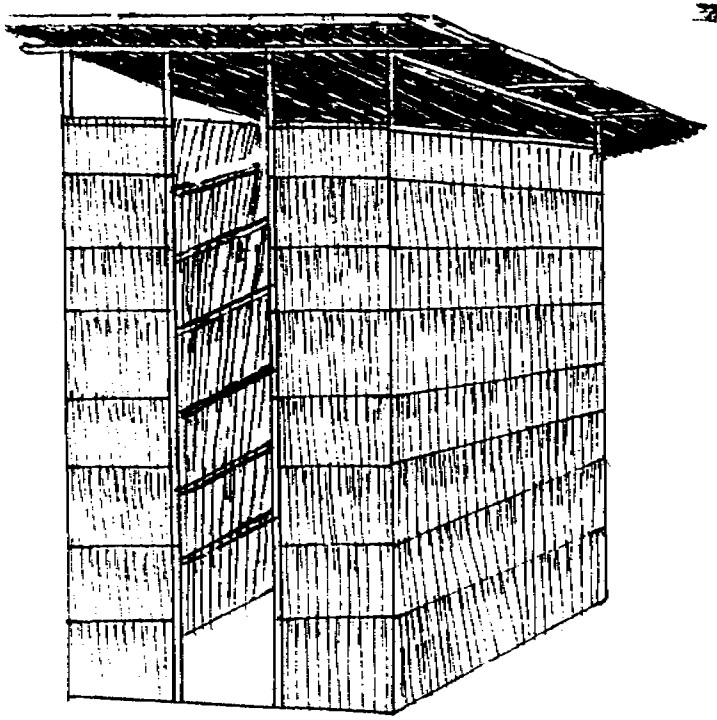


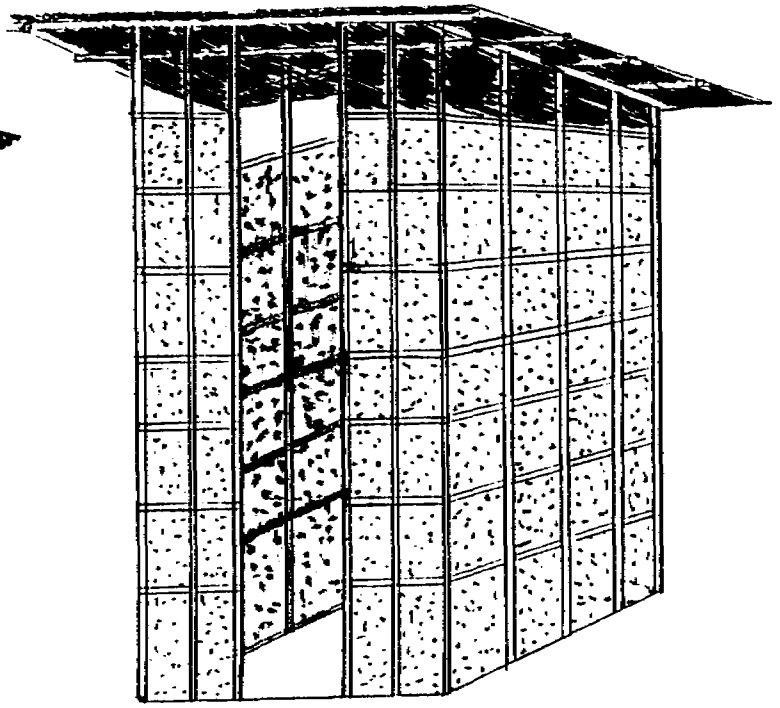
SKETCH 2



SKETCH 3







ROOF - MAKUTI

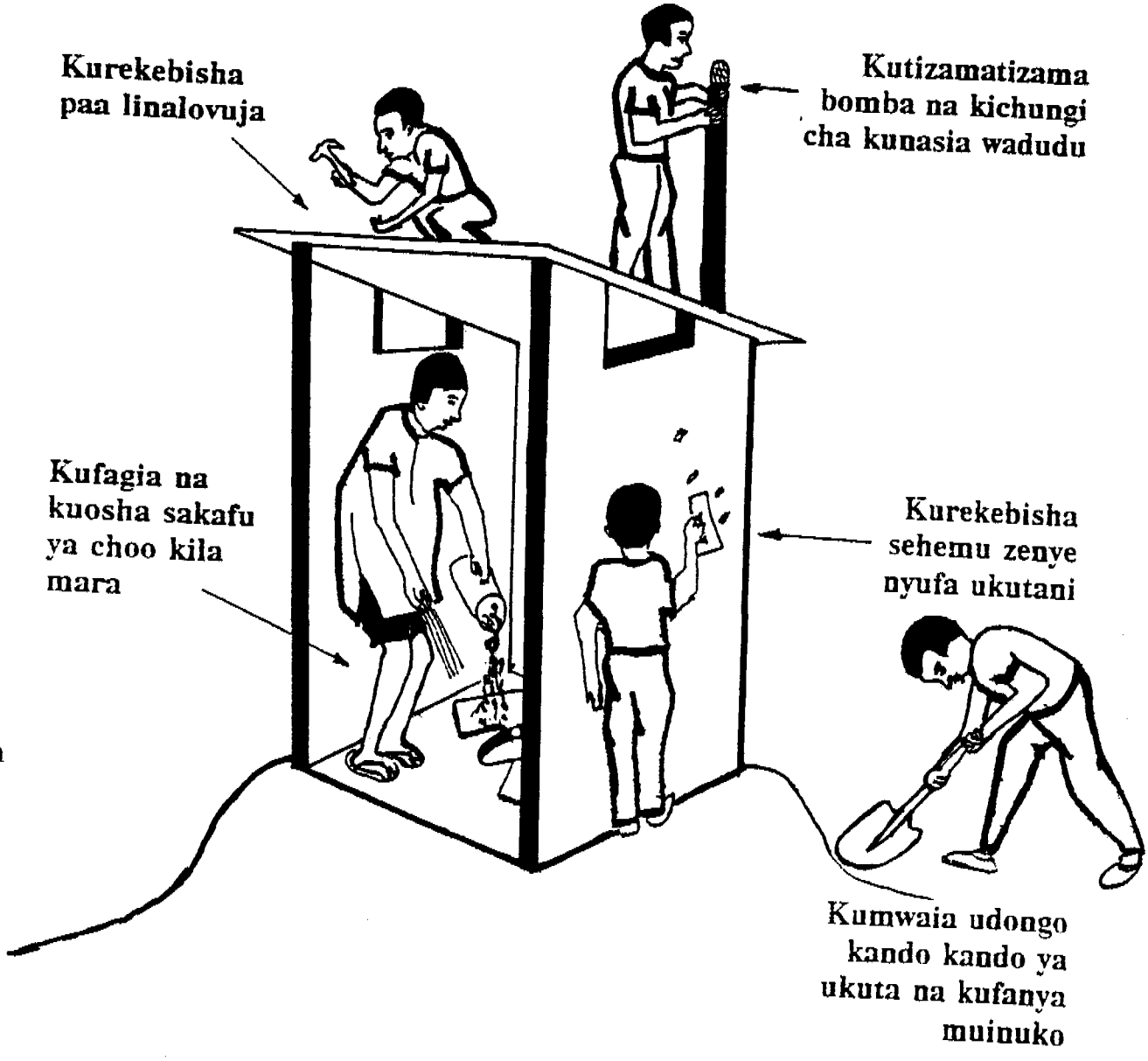
WALL - MAKUTI, MUD, WATTLE

MAINTENANCE

It is through Maintenance that the V.I.P. Latrine system will last long and work effectively and be hygienic enough. Regular maintenance is required in the following components:

1. **Fly Screen** - should be checked regularly and worn out fly screens must be replaced with new ones
2. **Vent Pipe** -Spiders have a tendency of forming cob webs in Vent Pipes. These should be removed.
3. **Shelter** -Leaking roofs should be blocked and damaged walls repaired.
4. **Surroundings** -The drainage system around ground level surrounding the pit must be maintained in order to expel any stagnant rain water from collecting near the latrine. Grass should be planted here so as to avoid any soil erosion that occurs during the Rainy season.

UANGALIZI WA CHOO



VIP LATRINE DESIGN OPTIONS

VIPs can be designed in several combinations in the following ways:

a) non-emptiable/emptiable

b) single-pit/alternating twin-pit

c) unlined/lined

d) not raised/raised

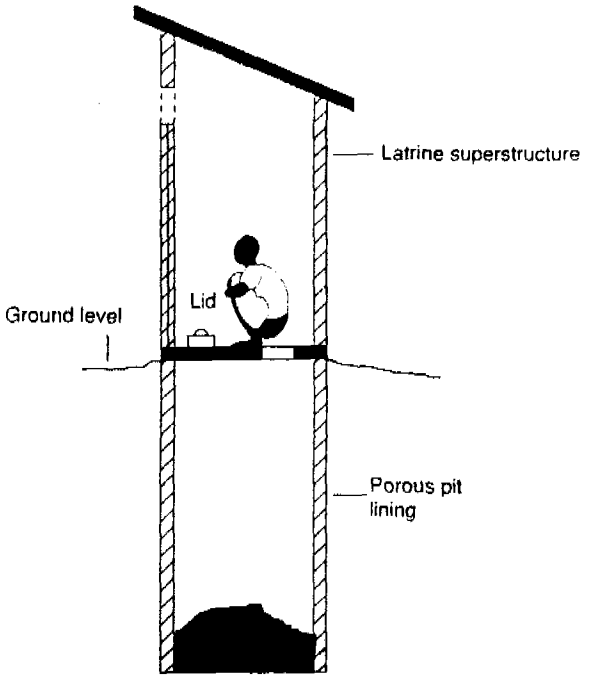
The negative options are given first as these are the cheaper.

Emptying	i	permits the latrine to be a permanent facility
	ii	requires good organizational capacity in responsible authority, especially if mechanised emptying vehicles used
	iii	if manual emptying socially feasible, then alternating twin-pit option must be used so that emptier do not come into contact with viable pathogens
	iv	if mechanised emptying used and/or pits are raised, they must be fully lined
Alternating	i	essential if latrine to be emptied manually
	ii	desirable if pits must be shallow (eg shallow unpickable rock present)
	iii	advisable if groundwater pollution must be minimized (when used as on-site supply - eg shallow wells)
Lining	i	pits must be fully lined in unstable soils with open-joint brickwork, blockwork etc.; instable soils pit walls should be plastered with 1:5 cement mortar Stable soils have undrained shear strength > 20 kN/m^2 (in situ vane test) and usually a clay content > 30 percent.
	ii	lining permanently wet pits is difficult
Raising	i	essential if groundwater table permanently or seasonally within 30 cm of ground surface; raise the pit by 30-50 cm
	ii	if pits are raised, they must be fully lined

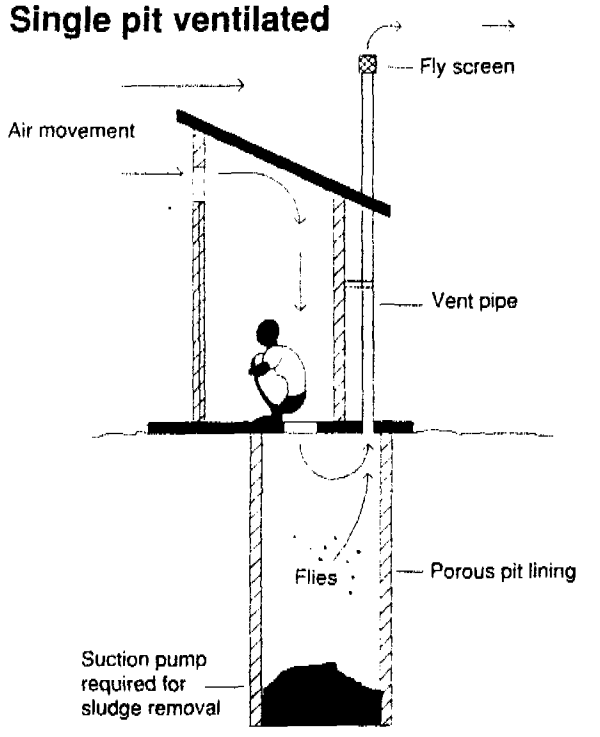
A guide to sanitation selection

Drawings 1-6 illustrate the principal options for on-site sanitation. The *Guide to Sanitation Selection* on the centre pages may be used to determine which option is likely to be most effective according to the method of anal cleansing, water availability and willingness to pay.

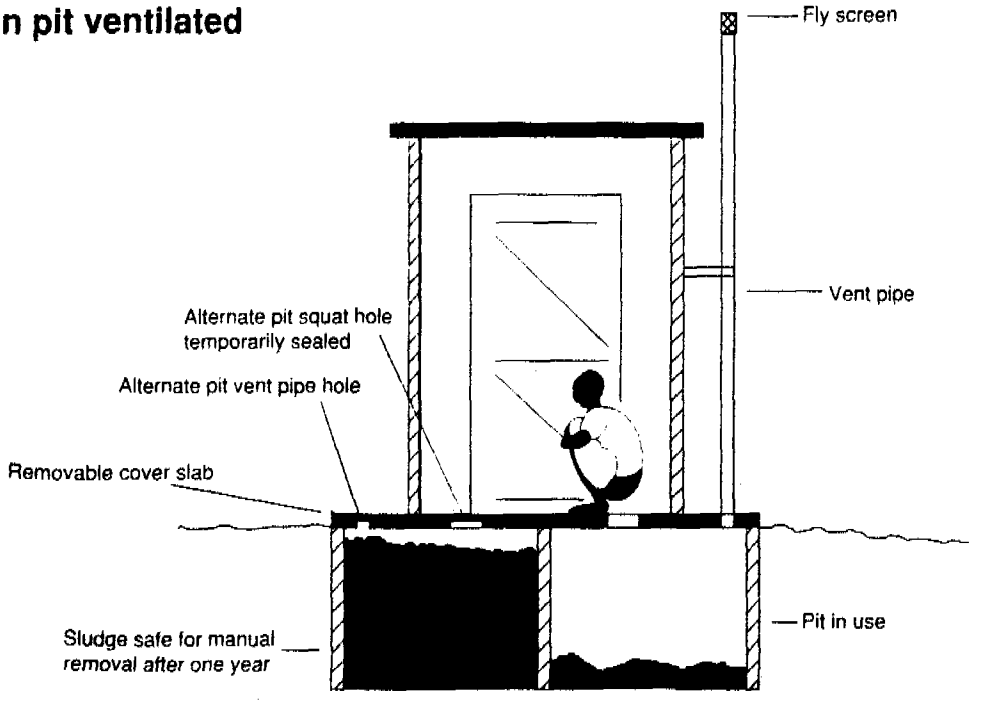
1. Single pit sealed lid



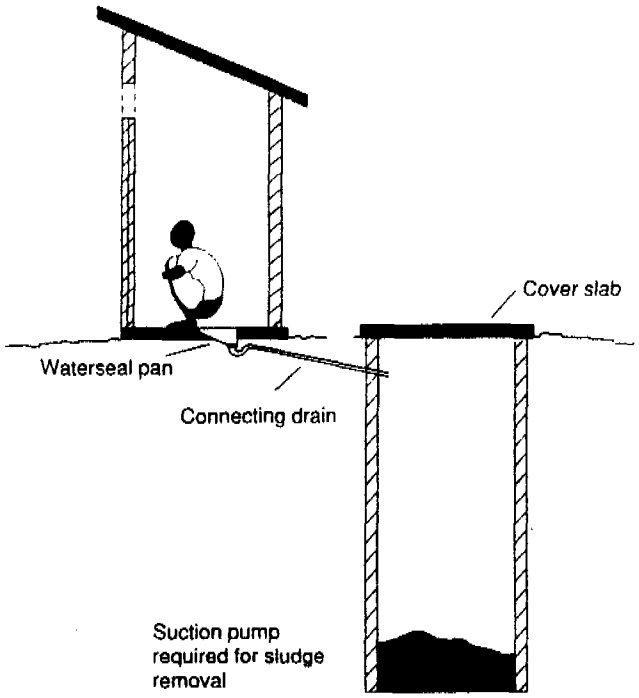
2. Single pit ventilated



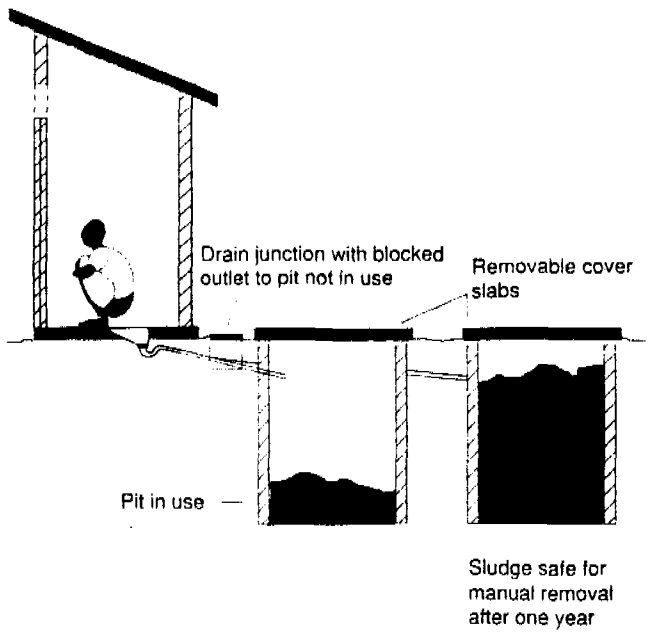
3. Twin pit ventilated



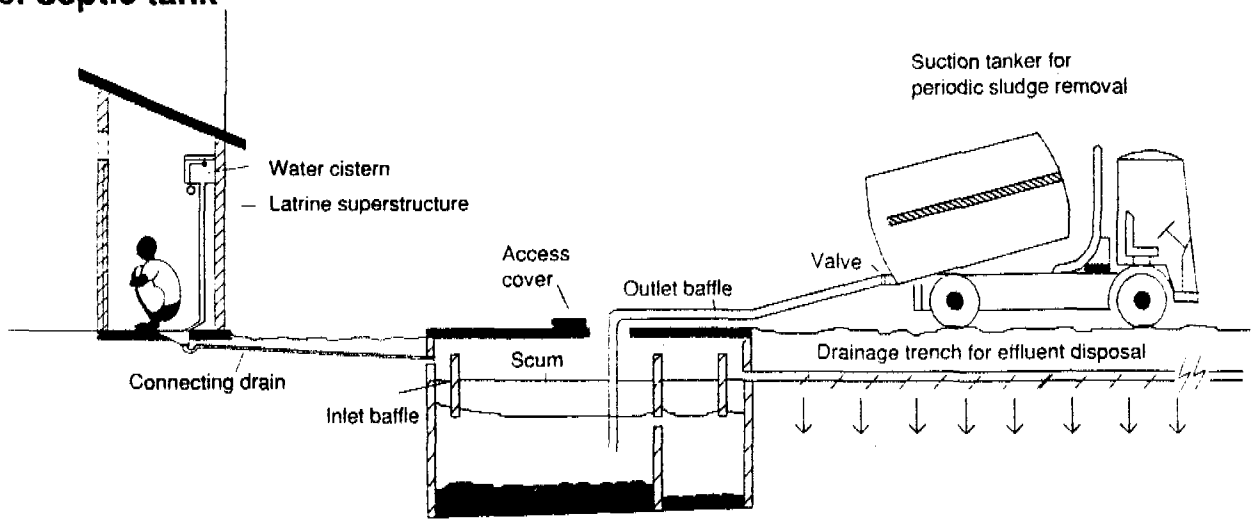
4. Pour flush single pit offset



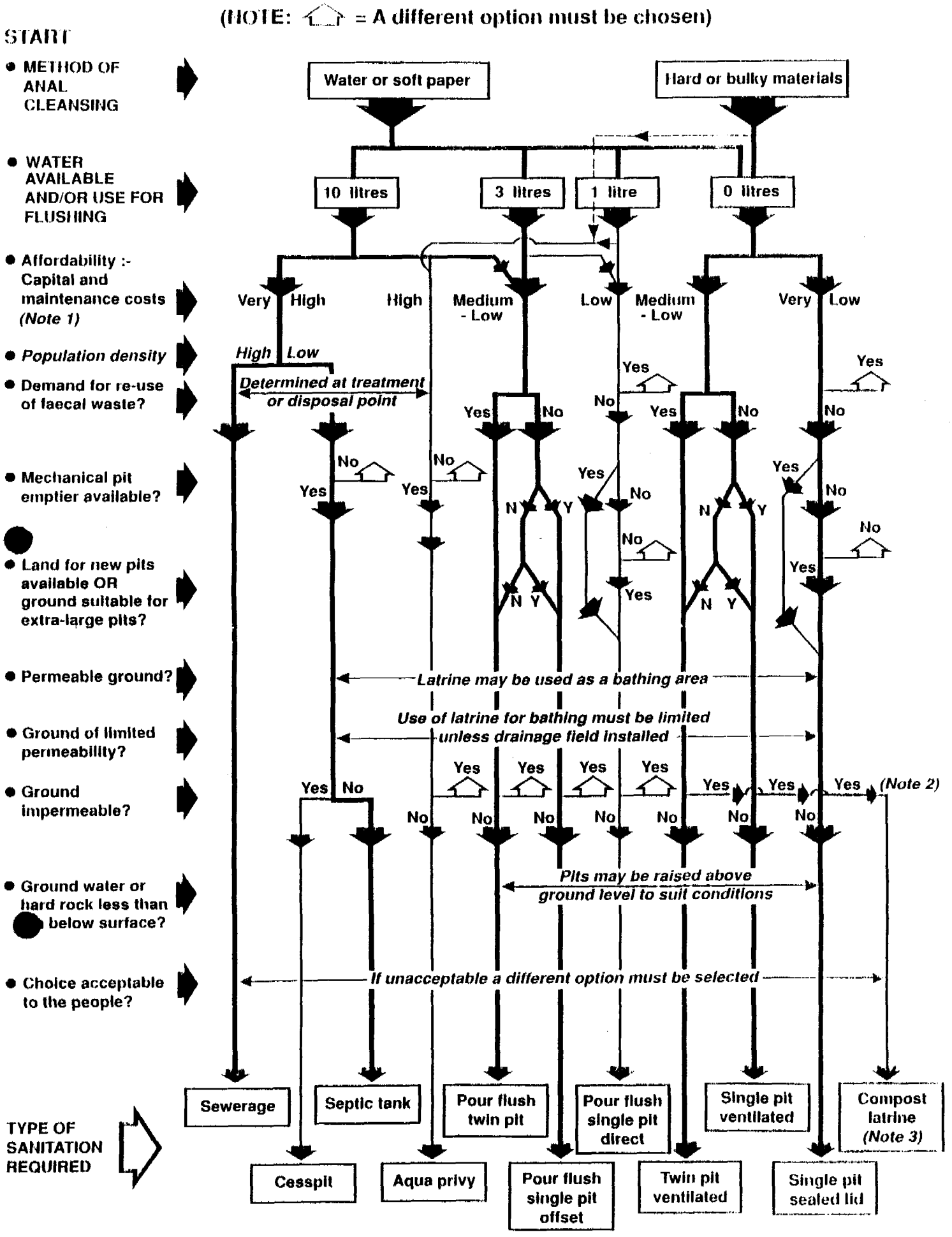
5. Pour flush twin pit



6. Septic tank



Note: In all systems, seats may be used as an alternative to squatting



Note 1: Not all possibilities are illustrated as it is assumed that water availability is related to affordability

Note 2: Use extra large pits or consider composting

Note 3: Also dependent on willingness to collect urine separately, demand for compost, availability of ash or vegetable matter etc

FLIES ASSOCIATED WITH PIT LATRINES

1. Flies as intermediate hosts of disease

   a) Mosquitoes - Culex sp. - Bancroftian filariasis

   Culex will tolerate high levels of pollution.

   Culex must have high amount of water i.e. wet latrines

   Even where there is no Bancroftian filariasis, Culex can be a nuisance.

   b) Mosquitoes - Aedes/Anopheles - Malaria

   Will not tolerate high levels of pollution

   Not found in pit latrines

   NB may be some evidence for change in Anopheline behaviour

2. Flies as passive carriers of disease

   a) Blowflies - Calliphoridae - Chrysomya sp.

   Blowflies will tolerate liquid or solid excrement, therefore found in most pit latrines.

   b) Houseflies - Muscidae - Musca domestica

   Houseflies which interact with human i.e. M. domestica needs fairly solid media to breed in, therefore not so common,

3. Flies as nuisance.irritation factors

   a) Hermetia sp. - breaks excrement down to a fluid condition, therefore keeps Musca domestica out. Where Hermetia sp. is controlled in dry latrines excrement remains more solid, find increase in M. domestica. Large numbers of Hermetia are nuisance in latrines to users - little interaction with humans outside latrines.

   b) Psychoda sp. Small hairy flies - breed in huge numbers in all types of sewage systems. Do not bite but some people may be very sensitive - allergic reactions to contact.

   c) Family Syrphidae. Larvae feed in excrement in latrines (mainly wet latrines) they are scavengers, many species are predators on other insects. Adults do not specifically interact with humans. Nuisance

METHODS OF CONTROLLING FLIES IN PIT LATRINES - NOTES

1.	Ventilated pit latrine	-effect of directional air/odour movement -single light source blocked to prevent escape or entrance by flies
2.	Insects traps on VIP latrines	-to physically catch insects either trying to move in or out of latrines -trap on vent or drop hole or both -good demonstration to latrine users of effectiveness roof ventilation
3.	Insecticides - effective	BUT -need frequent application -resistance -expensive -supply/distribution -mammalian toxicity -seepage to groundwater
4.	Biological control	-early stages in research -investigations into pathogenic bacteria Bacillus sp. -investigations into predatory non blood sucking mosquito - Toxorhynchites -little environmental or human damage -should be self supporting once established -easier said than done
5.	Liquid surface sealants	-oil -cheap -spreads well -get bacterial breakdown -need to replace frequently -? use on solids
6.	Solid surface sealants	-polystyrene beads -good control of Culex -long lasting - >= 2 years -expensive $2-4/latrines -subject to availability and distribution

FEATURE

In African villages, the provision of community handpumps help guard against a host of water borne diseases.

Promoting hygienic habits that protect against diarrhoea

UNSAFE water supplies and insanitary means of waste disposal are elements of a vicious cycle which poses a continuing threat to child health and survival in much of Africa today.

Diarrhoeal diseases, related to inadequate water supplies and sanitation services and poor personal hygiene severely debilitate children, leaving them especially vulnerable to malnutrition and infections. However, recent studies by the United States Agency for International Development (USAID) and the World Health Organisation (WHO) have shown that the provision of improved water supply and sanitation services can reduce the prevalence of diseases in a community by at least 26 per cent. And experience confirms that importance of linking water supply and sanitation programmes with health nutritional and socio-economic considerations for the overall betterment of child health and development throughout the continent.

There is strong correlation between accessible water supplies and nutrition. In communities with inadequate water supplies, women and children spend inordinate amounts of time carting water from distant sources. Precious calories and energy are wasted in this daily pursuit.

One study in Sudan found that an easily accessible water source saved women about six hours a day of fetching and carrying — time which could be devoted to other tasks including food processing or income-earning occupations. Accessible water supplies also eased the burden on children, and young girls inparticular who might spend their time more productively at school.

Inadequate water supply and sanitation encourage the transmission of infectious and parasitic diseases including diarrhoea, typhoid, trachoma, intestinal worms and skin diseases. In parts of Africa water-borne diseases including schistosomiasis and dracunculiasis (guinea worm disease) are rampant. In sub-Saharan Africa, 19 countries are affected by guinea worm disease which incapacitates victims for as much as three months of the year. A 1987 study in four states of Nigeria estimated that the value of labour lost guinea worm during the annual rice harvest was about US$20 million. Eradication efforts have cut the incidence of guinea worm disease in Nigeria by 39 per cent of some 390,000 cases, in past year.

The International Drinking Water Supply and Sanitation Decade (1981-1990) did not achieve its goal of Water and Sanitation for All. Its objectives were largely overwhelmed by new demand created by population growth and hampered by funding limitations. Other constraints included a shortage of trained personnel for the installation, operation, management and maintenance of water supply and sanitation systems.

Despite these limitations, however, access to safe drinking water did increase in urban areas of Africa from 83 per cent of the population to 87 per cent and in rural areas from 33 per cent to 42 per cent. Sanitation coverage levels increased from 65 per cent to 79 per cent for urban areas, and from 18 per cent to 26 per cent for rural area..

The challenge for most nations attempting to meet their water and sanitation goals has been to find ways of doing more with less. It was obvious, given the urgent needs of most African nations at the beginning of Water and Sanitation Decade, that communities could not afford to wait until resources were avilable for large-scale dam construction and other water supply systems similar to those serving households in the industrialised world.

In addition to the cost of such infrastructure the dispersal of populations in small communities separated by vast distances ruled out economies of scale which had worked in other regions. For the near future at least, the maintenance of centralised systems with pumping stations and water mains supplying door-to-door services was considered impractical for all but the large urban centres.

The focus in much of Africa, therefore, has been on the development of self-sustaining community-based water supply systems, such as handpump-equipped boreholes, protected dug wells or springs and gravity-fed systems and household excreta disposal using basic technologies such as improved pit latrines. The improved pit latrine has become the most popular technology for sanitation in rural and small urban communities of Africa. Malawi, Sierra Leone, Sudan, Tanzania and Uganda are attempting to strenghthen their programmes for sanitation by broadening the scope to include attention to waste disposal personal hygiene and household cleanliness.

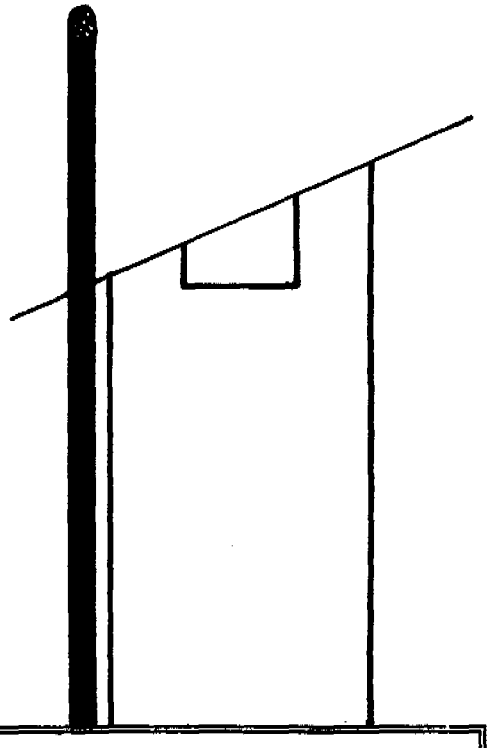
Among the countries actively pursuing community-based strategies to improve water supply and sanitation are: Burkina Faso, Burundi, Cape Verde, Ethiopia, Ghana,

Guinea-Bissau, Malawi, Mozambique, Nigeria, Somalia, the Sudan and Uganda. Committees have been formed to manage their systems' maintenance, and in the Sudan, 800 villages have established five-member committees, with at least one woman member on each.

Recent reports from water project sites in Benin, Egypt, the Sudan and Uganda indicate that the training of women as caretakers for community water supply systems has been very successful.

VENTILATED IMPROVED PIT LATRINE V.I.P.

K I W A S A P



ELIMU YA MAJI NA USAFI

VENTILATED IMPROVED PIT LATRINE
CHOO IMARA CHENYE HEWA SAFI

UTANGULIZI

Ni jambo la muhimu sana kuwa na vyoo manyumbani mwetu, tukifahamu kwamba maradhi mengi sana yanayotukumba yanahysiana sana na vinyesi vinavyotupwa ovyo-ovyo kwa kutokutumia vyoo manyumbani mwetu.

Magonjwa ya tumbo, kuhara na hata minyoo ni baadhi ya aina ya magonjwa yanayotupata ikiwa hatutumii vyoo manyumbani.

Wadudu, maji na hata upepo husaidia kusambaza viini ambavyo baadaye huwafikia watu na kuwaambukiza magonjwa hayo.

Kuna aina nyingi sana ya vyoo ambavyo vinawezekana kujengwa, kwa mfano kuna aina ya vyoo ambavyo hujengwa mijini pekee na kuna aina nyingine ya vyoo ambavyo hujengwa katika sehemu za mashambani.

Hapa tutazungumzia juu ya choo ambacho kinafaa zaidi kutumika katika sehemu za mashambani: Choo hiki ni kile kinachojulikana kama choo imara chenye hewa safi (Ventilated Improved Pit Latrine).

TOFAUTI YA CHOO CHA KIENYEJI NA CHOO IMARA CHENYE HEWA SAFI

1 Vyoo vya kienyeji hujengewa sakafu ambayo baada ya muda mfupi huoza na kubomoka au ikiwa saruji au simiti ilitumiwa basi choo hicho kikishajaa sakafu hiyo hubidi ivunjwe, kitendo kiletacho hasara. Lakini choo imara chenye hewa safi hutengenezewa sakafu za vifuniko ambavyo ni vigumu sana, na baada ya choo kujaa, vifuniko hivyo huondolewa na kutumika tena.

2. Vyoo vya kienyeji havijengewi misingi ya ukuta katika sehemu za juu ya shimo, kitendo ambacho husababisha maporomoko ya udongo shimoni hadi choo kudidimia. Choo imara chenye hewa safi hujengewa kuta hizi na maporomoko hayafanyiki.

Vyoo imara vyenye hewa safi hutiwa bomba la kutolea harufu mbaya na juu ya bomba hili hufungiwa kichungi cha kuwanasa wadudu kama vile Mainzi.

Vyoo vya kienyeji havina bomba la kutolea harufu mbaya jambo ambalo linavifanya viwe na harufu mbaya na Mainzi wengi huwa na uhuru wa kuingia chooni na kutoka hadi manyumbani mwetu, na kutuambukiza magonjwa hatari.

SEHEMU MUHIMU NA JINSI ZINA VYOFANYA KAZI KWENYE CHOO IMARA CHENYE HEWA SAFI.

1. SHIMO

Shimo ndilo ambalo huweka vinyesi na mikojo. Vinyesi hubakia na kujaza shimo, lakini mikojo hudidimia zaidi mchangani. Hii inatulazimu tuchimbe shimo hili kwaumbali usiopungua mita 30 ili mikojo hii isichafue maji yatokayo aridhini.

Shimo likiwa refu, pia vile huchukua muda kujaa. Ikiwa umependelea choo chako kidumu zaidi, na vile vile watu watakao tumia choo hicho ni wengi basi itabidi shimo lako lichimbwe refu zaidi. Ikiwa shimo lina duara yenye upana wa mita 1 1/2 au pembe za mita 1.2 kwa 0.85, na hapo nyumbani kuna watu kumi watakaotumia choo kwa muda wa miaka kumi, basi itabidi uchimbe shimo lenye urefu usiopungua mita 4 1/2. Shimo laweza kuwa duara au lenye pembe nne za mraba.

2. UKUTA UJENGWAO KATIKA SEHEMU ZA JUU YA SHIMO "LINING"

- Ukuta huu hujengwa ili kuzuia udongo mororo uliyo katika sehemu za juu usiporomoke. Pia vile vile ukuta huu huruhusu sakafu au kifuniko kulala juu yake.
- Ukuta huu waweza kujengwa kwa kutumia matofali ya mawe au ya udongo yaliyochanganywa na simiti kidogo. Matofaili haya huunganishwa kwa kutumia mchanga wa changarawe na simiti.

3. KIFUNIKO AU "SLAB"

Kifuniko au "slab" ni ile sehemu ya sakafu ya choo ambayo ina shimo la kunyelea, shimo la kuvishia bomba la kutolea harufu mbaya na sehemu za kukanyagia.

Kifuniko hiki hutengenezwa kwa kongreti na waya za cheke cheke ngumu ambazo hukipatia ugumu mkubwa. Kifuniko chaweza kuwa cha mviringo au chenye pembe nne za mraba.

4. BOMBA LA KUTOLEA HARUFU MBAYA

Bomba la kutolea harufu mbaya chooni ndio sehemu moja maalumu ambayo inatafautisha vyoo vya kienyeji na vyoo imara vyenye hewa safi.

Bomba hili hufunya kazi vizuri zaidi ikiwa mahali hapo pana upepo wa kutosha.

Pia vile vile bomba hili hutakiwa liwe refu zaidi juu ya paa la choo kwa kama nusu mita. Mifereji ya plastiki yenye duara kuanzia milimita mia moja hutumiwa. Pia vile vile matofali yaweza kujengea sehemu hii na kipimo chake ni milimita 225 x 225.

5. KICHUNGI CHA WADUDU

Kichungi hiki hufungiwa juu ya bomba la kutolea harufu mbaya.

Wadudu kama vile inzi wanapoingia shimoni mwa choo huvutiwa sana na mwanga unaopitia bombani na kutaka kutoroka kupitia bomba hilo.

Wakati wanapopitia sehemu ya juu kabisa, kichungi huwazuia mainzi hawa mpaka wafe na kutumbukia shimoni.

6. KIBAO CHA KUZUIA MWANGA

Kibao hiki hutumiwa ikiwa kuna mwanga ambao unaingia moja kwa moja kupitia shimo la kujisaidia, ili kuzuia mwanga huu.

Kibao hupewa nafasi kwa sehemu ya chini ambayo husaidia kuingiza hewa safi.

Ikiwa mwanga utaruhusiwa kupitia shimoni moja kwa moja basi mainzi watakuwa na uhuru wa kuingia na kutoka shimoni.

7. MJENGO

Hii ni ile sehemu ambayo ukuta hujengwa ili kumzuia mtu asionekane wakati anapojisaidia chooni. Kuta hizi zaweza kujengwa kwa namna ambazo wenyeji wanazo pendelea na vifaa vitakavyotimika viwe vinapatikana humo humo mitaani.

Kuta za miti na udongo, matofali ya udongo na simiti, hutumiwa kujenga ukuta.

Paa laweza kuwa la bati,nyasi au makuti. Milango pia yaweza jengwa kwa kutumia makuti.

GHARAMA ZA UJENZI

Ili kupunguza gharama za ujenzi wa vyoo imara vyenye hewa safi ni muhimu sana kutumia bidhaa zinazopatikana humo humo mitaani kwa urahisi.

Hata hivyo katika sehemu moja ambayo vyoo hivi vimejengwa, imekisiwa kuwa gharama zote za ujenzi wa choo kimoja imara chenye hewa safi ni kama Ksh. 1,320,--.

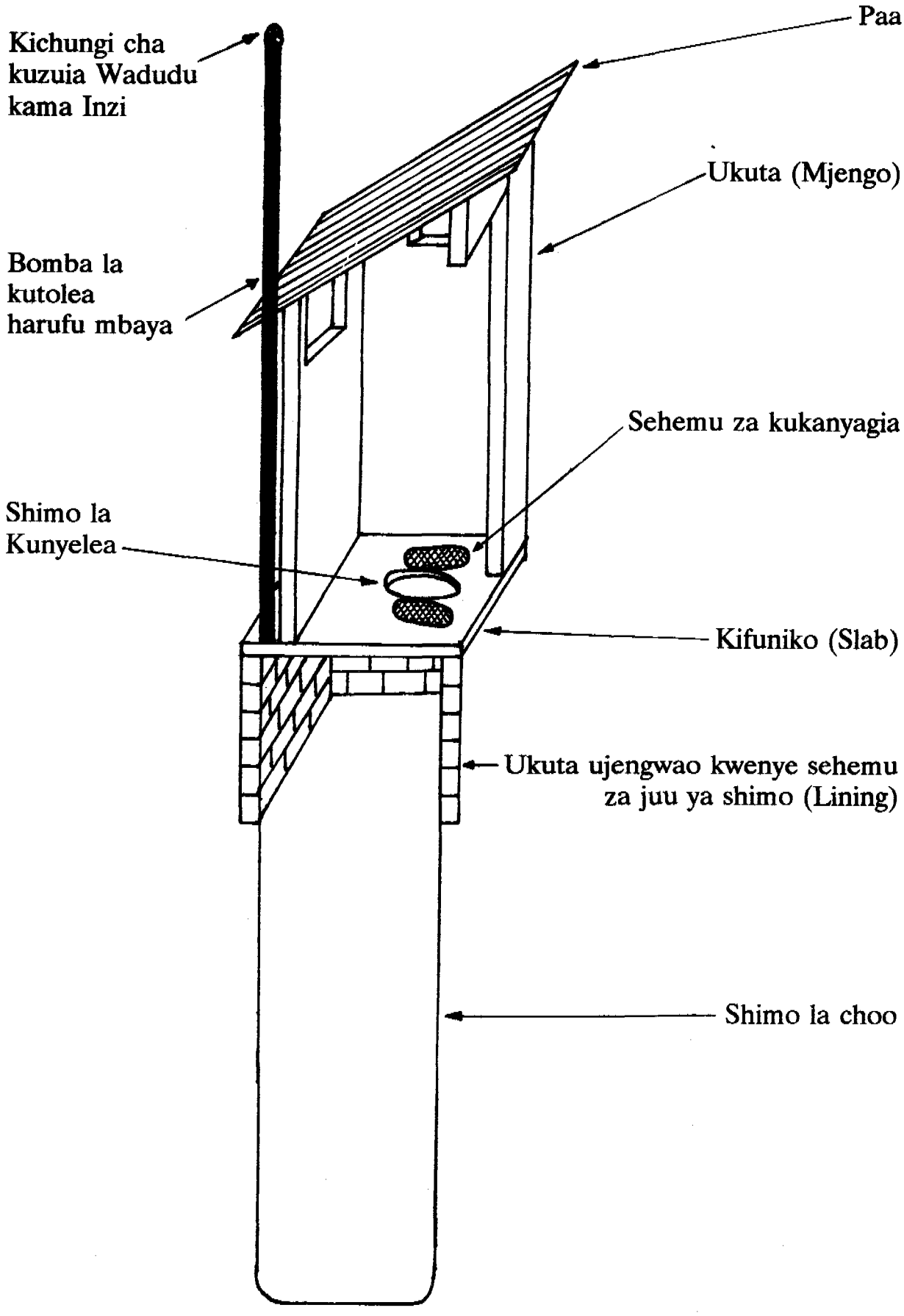
KUTUNZA CHOO

Utunzaji wa vyoo ni muhimu sana, ili kuhakikisha kwamba vinafanya kazi vizuri na havitatusababishia magonjwa ya hatari.

Utunzi wa vyoo unaotakikana ni kama ufuatao:-

1. Kila mara hakikisha choo kimewekwa safi kwa kufagiliwa
2. Kichungi kilichofungwa juu ya bomba kitizamwe kila mara naihakikishwe kwamba hakipitishi mainzi.
3. Bomba la kutolea harufu mbaya liangaliwe vizuri na ihakikishwe kuwa maji ya mvua yataondoka upesi bila kuchelewa, kwa kufanya muiniko kwa kujaza mchanga kando ya choo.
4. Hakikisha kuwa paa lako halitavuja na kusaidia kubomoa ukuta wa choo

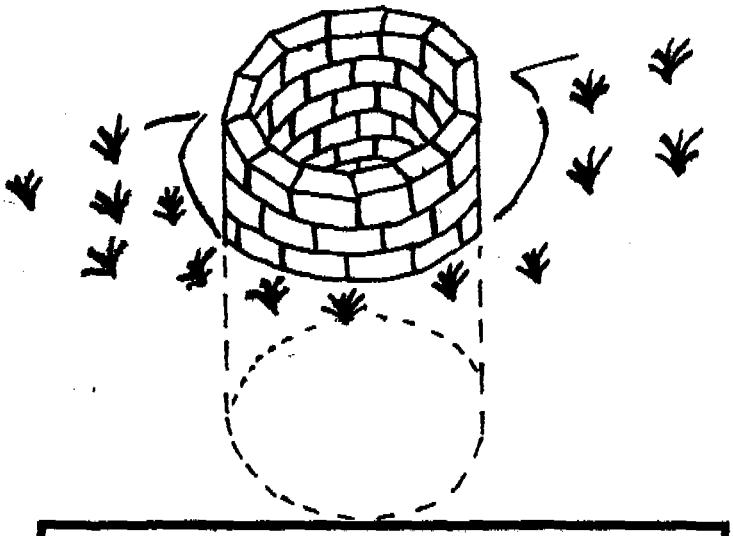
SEHEMU ZA CHOO IMARA CHENYE HEWA SAFI



CHOO IMARA
CHENYE HEWA SAFI
(V.I.P. - LATRINE)

K I W A S A P

KUTA ZIJENGWAZO
SHIMONI
(PIT LININGS)



ELIMU YA MAJI NA
USAFI

CHOO IMARA CHENYE HEWA SAFI

KUTA ZIJENGWAZO SHIMONI (PIT LININGS)

Ni jambo la kuhuzunisha sana kufahamu kwamba watu wengi sana wamepata hasara kubwa kwa kuporomokewa na vyoo vyao haswa wakati wa msimu wa mvua. Vyoo vinapoporomoka huwa ni hatari sana kwani huweza pia kusababisha hata vifo kwa wanao vitumia kuporomokea shimoni.

Madhara haya yamekumba sana vyoo vya kienyeji ambavyo ujenzi wake haukutilia maanani hali za ugumu wa udongo ardhini. Maporomoko ya vyoo vya kienyeji hutokea kwa sababu sehemu za juu juu ya ardhi wakati mwengine huwa na udongo ulio mororo sana; ambao huwa nivigumu sana kustahimili uzito wa paa na jumba la choo; utakaouelemea. Shida mara nyingi hutokea wakati wa mvua inayosababisha mzizimo ardhini.

Njia ya ujenzi wa choo imara chenye hewa safi humaliza shida hii, kwa sababu sehemu hii ya juu juu iliyo na ardhi nyororo, hujengewa ukuta (lining). Ukuta huu pia vile vile huwa kama msingi kwa kuzuia uzito wa nyumba na kifuniko (slab) ambayo hulazwa juu yake.

VIFAA VYA UJENZI WA KUTA HIZI

Matofali ya mawe, konkreti, mapande ya mawe, matofali yenye mchanganyiko wa udongo na simiti (stabilised soil blocks), miti migumu isiyoliwa na mchwa au plasta ya mchanga na kadhalika hutumiwa kwa kujengea kuta hizi. Hata hivyo bidhaa zisizo oza au kuharibika haraka zafaa zitumiwe.

UTARATIBU WA UJENZI WA KUTA HIZI

1. **Kwanza - Upimaji wa shimo**

   Upana wa shimo litakalo chimbwa na kujengewa ukuta hutegemea sana na kifuniko (slab) kitakachotumika.

   Ikiwa kifuniko cha duara chenye upana wa milimita 1240 kitatumika, basi shimo lenye upana wa milimita 1500 lipimwe na lichimbwe kama mita moja na kuufikia udongo mgumu.

   Ikiwa kifuniko ni cha pembe nne za mraba chenye vipimo vya milimita 1200 kwa 850, basi shimo lenye upana wa milimita 1500 kwa 1100 lipimwe na shimo lichimbwe hadi mita moja na kuufikia udongo mgumu.

2. **PILI - Uchimbaji wa sehemu ya kujengewa ukuta**

Baada ya kupima vipimo hivi tulivyoelezewa hapa juu, tia alama kwa mchoro. Uchimbaji utafanywa hadi sehemu za pembe ya michoro hiyo. Uchimbaji utaendelea hadi pale udongo ulio mgumu kufikiwa. Katika sehemu nyingi udongo mgumu hupatikana baada ya kama mita moja. Lakini kuna sehemu ambazo hubidi shimo lichimbwe refu sana hadi kuufikia udongo mgumu. Udongo mgumu ukishafikiwa, hapo uchimbaji utasimamishwa na ujenzi wa ukuta kuanza.

3. **TATU - Ujenzi wa ukuta**

Baada ya sehemu ya kujengewa ukuta kuchimbwa, hakikisha udongo mororo uliochimbuliwa umeondolewa na kutupwa mbali.

- Ikiwa shimo ni la duara, ingia ndani na upime sehemu itakayojengewa ukuta kwa kupima duara yenye upana wa milimita 1040. Sehemu ya ndani ya duara hii ndipo shimo la choo litakapo chimbiwa na sehemu ya nje ya duara hadi ukutani mwa udongo ndipo ukuta utakapojengewa.
- Ikiwa shimo ni la pembe nne za mramba vipimo vya ndani vya kujengewa ukuta ni milimita 1000 kwa 700 mraba.
- Tumia mchanganyiko wa simiti moja na changarawe tano kwa kuunganisha tofali.

KUCHIMBA SHIMO

Baada ya ukuta kukamilika, uchimbaji wa shimo uanzwe. Shimo lichimbwe hadi pembe ya ukuta na wala usizidi pembe hii au kupungua. Hakikisha kuwa shimo lako limechimbwa na likanyooka vizuri. Ibaki kama mita moja unusu kabla ya kufikia maji.

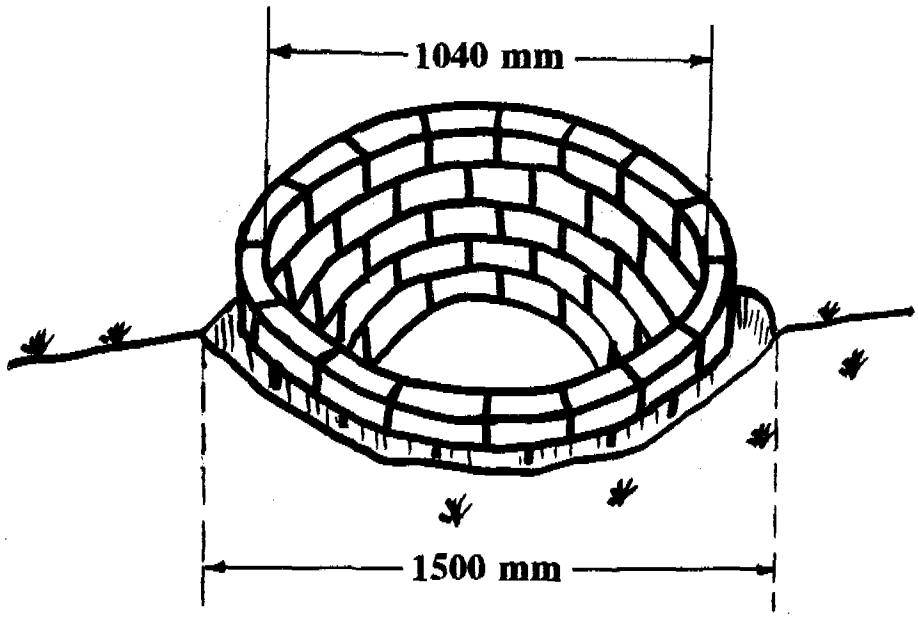
MAELEZO MUHIMU

Katika ujenzi huu tuliozungumzia hapa, hakikisha kila mara kwamba:-

1. Ukuta utakaojengwa uwe umenyooshwa vizuri na kuwa wima
2. Sehemu za kando kando ya ukuta zimejazwa mchanga
3. Ukuta umejengwa hadi milimita 150 zaidi juu ya ardhi
4. Shimo halitachimbwa hadi kufikia maji
5. Shimo limechimbwa na kunyooka vizuri

UKIWA UNA SWALI AU MAONI ZAIDI WASILIANA NA KIWASAP, KILIFI

VIPIMO VYA SHIMO NA UKUTA UJENGWAO SHIMONI

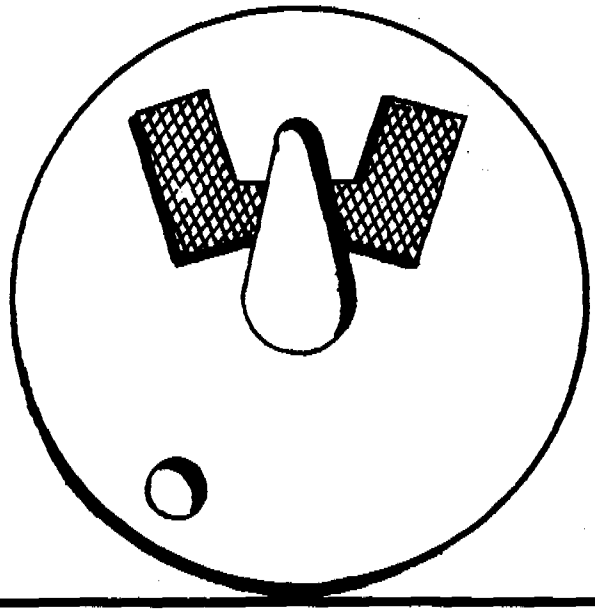


Urefu wa ndani kawaida ni mita moja.
Lakini sehemu zingine hubidi zichimbwe
zaidi ya mita 1 hadi kufikia
ndongo ulio mgumu na timamu.

CHOO IMARA CHENYE HEWA SAFI
(V.I.P. - LATRINE)

K I W A S A P

SAKAFU ZA KIFUNIKO
(SQUATTING SLABS)



ELIMU YA MAJI NA USAFI

SAKAFU YA KIFUNIKO

(Squatting Slab)

Ni jambo la kusikitisha sana kufahamu kwamba tangu zamani ujenzi wa sakafu za vyoo vyetu umekuwa ni wa hasara na gharama nyingi na pia vile vile vimekuwa hatari kwa kuporomoka na kuanguka ovyo ovyo licha ya kuwa vyoo hivyo pia vimesaidia sana kutuenezea magonjwa mbali mbali, haswa yale ya minyoo.

Sakafu za vyoo hivyo zimekuwa zikijengwa kwa kutumia magogo ya miti ambayo yalipangwa toka upande mmoja hadi mwengine wa shimo la choo. Baada ya kupangwa vizuri, magogo hayo yalimwaiwa udongo (au simiti kwa wale walio weza) na kuacha kijishimo cha kupitishia kinyesi.

Hatari iliyopo hapo ni kwamba magogo hayo hayakuchukua muda mrefu kabla kuoza na jengo kudidimia shimoni, kitendo ambacho ni hatari na kilicho leta hasara.

Sakafu hizi za udongo zimekuwa na shida ya kufagiliwa vizuri au kuoshwa kwa kutumia maji, kitendo ambacho kimetusababishia uenezaji wa magonjwa mbali mbali kupitia kwa mainzi na hata kwa wanaotumia kukanyaga sakafu hiyo.

Ili kuzuia hasara hizo na uenezaji wa maganjwa hatari, ujenzi mpya wa choo imara chenye hewa safi umetokea. Ujenzi huu unahusisha sana utengenezaji wa **SAKAFU YA KIFUNIKO (Squatting slab)**

UTENGENAZAJI WA SAKAFU YA KIFUNIKO

(Construction of Squatting Slab)

Kifuniko hiki hutengenezwa kwa kutumia konkreti ambayo ni mchanganyiko wa simiti, mchanga wa changarawe na kokoto. Ili kukiongezea kifuniko hiki nguvu zaidi, vyuma au waya za chuma hutumiwa pia. Vyuma hivi humiminiwa kokoto na kufunikwa kabisa jambo ambalo huvizuia vyuma hivyo visipate mvuke au hewa ili kuzuia kutu. Mchanganyiko wa simiti - 1. changarawe - 2. na kokoto - 3. hutayarishwa na kupigiliwa sana mwenye kibao chenye umbo la sakafu ya kifuniko.

Vifaa muhimu hutumiwa kwa kutengenezea tundu la kupitishia kinyesi na mkojo (squat

hole). Kipande cha bomba la kutolea harufu mbaya hutmiwa kutengenezea tundu la kutolea harufu mbaya (vent hole). Sehemu za kukanyagia (foot rests) pia hutengenezwa katika sehemu za juu ya kifuniko (slab). Sehemu ya sakafu hulainishwa sana kwa kutumia mkono chuma.

UMBO LA KIFUNIKO (Slab mould)

Umbo la kifuniko hufanana na umbo la shimo litakalochimbwa. Kuna jamii fulani ambazo huopendelea mashimo ya mviringo au duara ambayo hutengenezewa vifuniko vya duara. Jamii zingine hupendelea mashimo ya pembe nne za mraba ambayo hutengenezewa vifuniko vyenye pembe nne za mraba. KIWASAP inatengeneza vifuniko vya duara vyenye upana wa milimita 1240, pia vile vile hutengeneza vifuniko vya pembe nne za mraba vyenye urefu wa milimita 1200 na upana wa milimita 850.

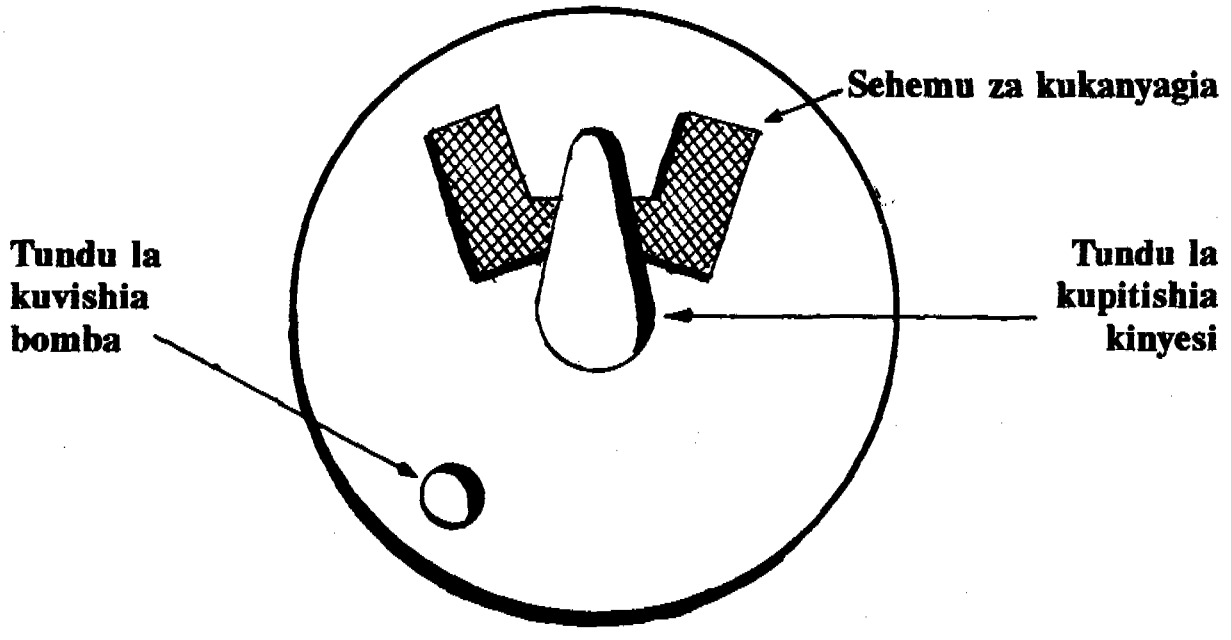
MANUFAA YA KUTUMIA SAKAFU YA KIFUNIKO (ADVANTAGES OF USING SQUATTING SLABS)

1. Ni rahisi kuosha na kufagia basi kutupunguzia uenezaji wa magonjwa.
2. Kifuniko hutumika kwa choo kingine tena baada ya kujaa
3. Kifuniko ni chepesi kwa kuhamisha
4. Kifuniko chaweza kutengenezewa hata nyumbani
5. Hakuna hasara za kuporomoka kwa choo

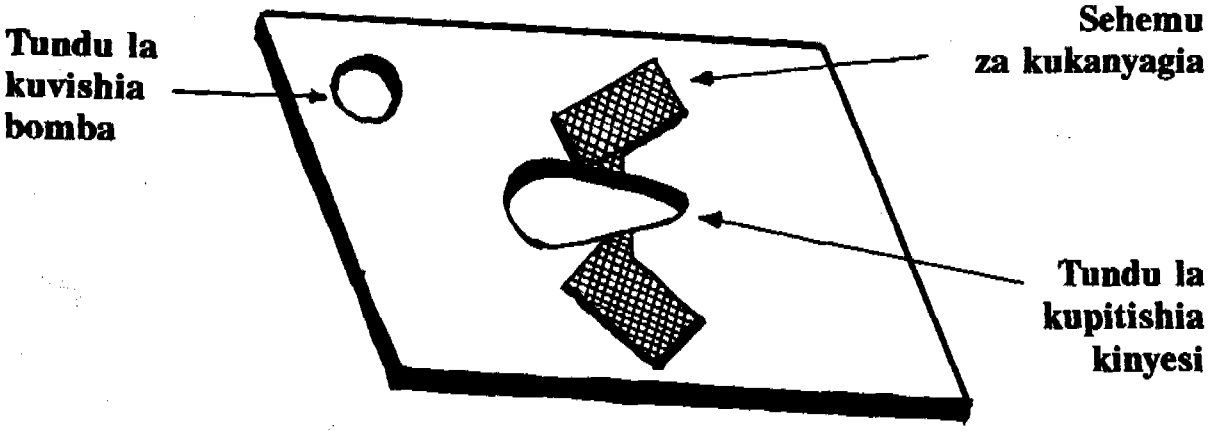
UKIWA UNA SWALI AU MAONI WASILIANA NA KIWASAP, KILIFI

SAKAFU ZA KIFUNIKO

KIFUNIKO CHA DUARA



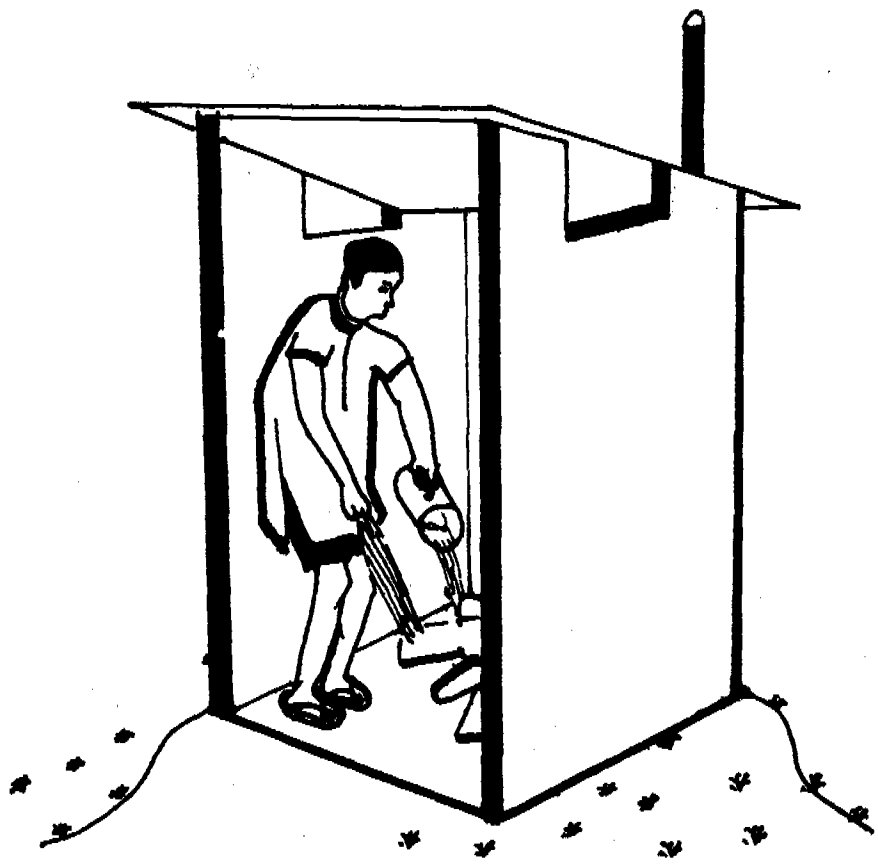
KIFUNIKO CHA PEMBE NNE ZA MRABA



CHOO IMARA CHENYE HEWA SAFI
(V.I.P. - LATRINE)

K I W A S A P

UANGALIZI WA CHOO
(MAINTENANCE)



ELIMU YA MAJI NA USAFI

UTUNZAJI WA CHOO
(MAINTENANCE)

Baada ya choo kukamilika kujengwa huo sio mwisho wa mambo. Utumiaji mzuri na utunzaji wa choo chako ni muhimu sana. Choo cha aina yeyote ile ni lazima kiangaliwe kila mara na kurekebishwa rekebishwa sehemu ambazo zinazokuwa na hitilafu. Sifuatazo ndizo sehemu za choo ambazo zinahitaji sana maangalizi ya kila mara.

1. KANDO KANDO YA MSINGI WA CHOO

Vyoo vingi sana vimekuwa vikibomoka na kudidimia shimoni kwa sababu sehemu za kando kando za msingi hazikujazwa udongo vizuri ili kuzuia maji maji (au mzizimio) kama vile ya mvua yasipenye hadi msingini. Maji haya yanapopenya hadi kufikia msingi, udongo huwa mororo sana na husabibsha msingi kuporomoka shimoni.
Hakikisha kuwa unamwaia udongo na kufanya muinuko kando kando ya ukuta wa choo. Muinuko huo hupandwa nyasi ili kuzuia mmomonyoko wa muinuko huo.

2. SHIMO LA CHOO (pit)

Shimo lisipotumiwa kwa hali ya uangalifu hujaa haraka sana. Shimo hujaa haraka ikiwa vitu vigumu vigumu kama vigunzi vya mahindi, mawe, maganda ya miwa, tembe za maembe, chupa, mikebe na kadhalika vitatupwa chooni.
Tusitumie sabuni kali kali au sumu. Sabuni au sumu huwaua vijidudu ambavyo hula kinyesi na kupunguza sana idadi ya kinyesi hicho shimoni.
Ni vizuri sana kumwagia majivu ndani ya choo. Majivu husaidia kupunguza harufu na pia vile vile hufanya kinyesi shimoni kuwa maji maji, hali ambayo hufurahiwa sana na vijidudu vinavyokula kinyesi shimoni.

3. **SAKAFU YA CHOO**

Sakafu ya choo huleta harufu mbaya sana chooni na hata kukaribisha mainzi ikiwa haifagiliwi na kuoshwa vizuri. Mainzi hawo wanaovutiwa na harufu hiyo ndio ambao baadaye hurudi manyumbani na kutuambukiza magonjwa. Kwa hivyo, hakikisha kwamba sakafu inafagiliwa na kuoshwa kila mara.

4. **UKUTA (wall)**

Ni vizuri ukuta wa choo kurekebishwa mara tu unapoonyesha dalili za nyufa ambazo zikipuuzwa, baadaye husababisha ukuta kuporomoka. Ni jambola aibu kutumia choo ambacho hakina siri ya kumficha mtu ndani.

5. **PAA (roof)**

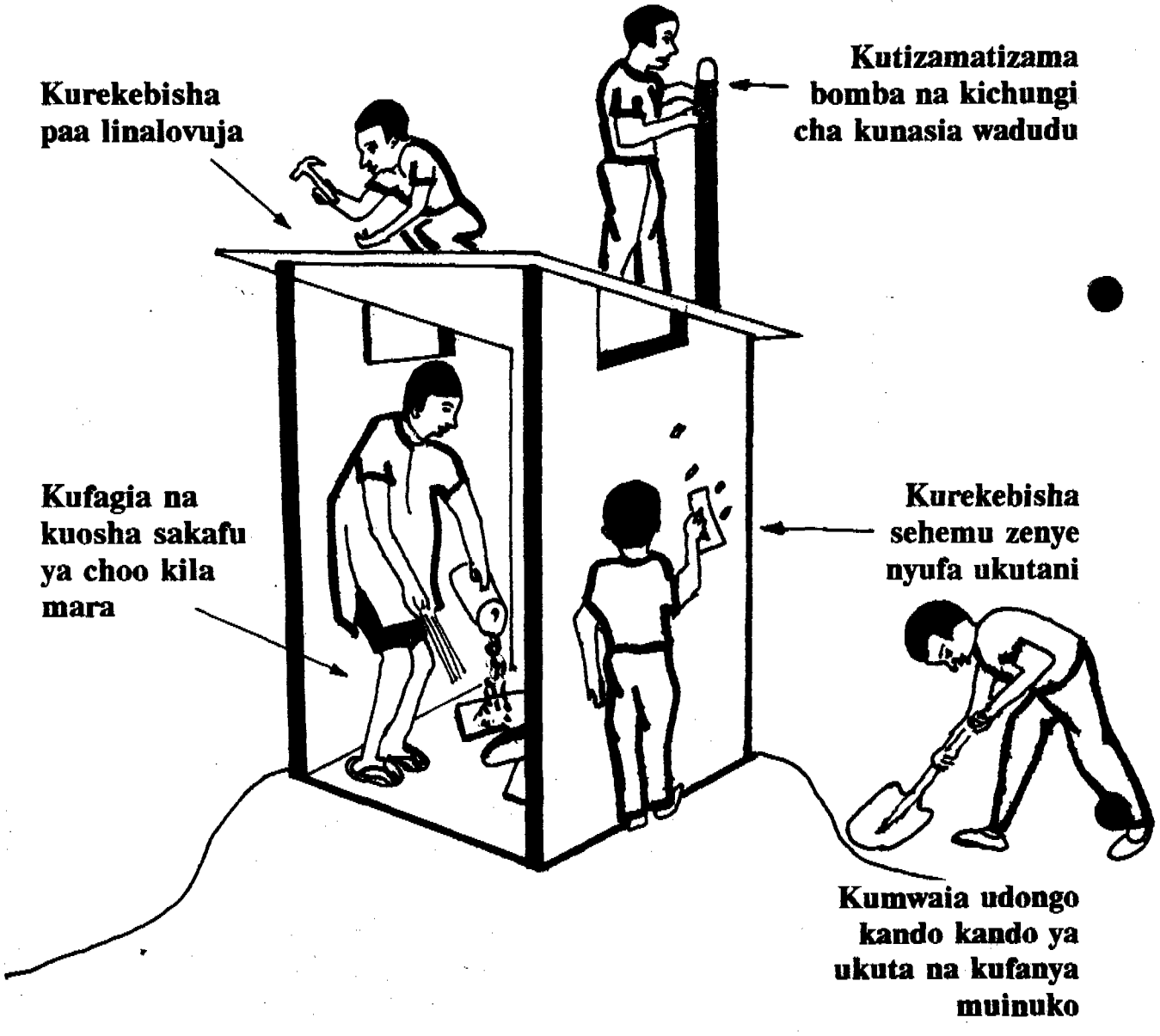
Paa za nyasi au makuti huvuja iwapo nyasi hizo au makuti hayo yamezeeka. Ni vizuri kubadilisha kwa kupaua na nyasi au makuti mapya. Ukuta hubomoka kirahisi ikiwa utavujiwa na maji ya mvua yanayodondoka kutoka juu ya paa linalovuja.

6. **BOMBA LA KUTOLEA HARUFU MBAYA NA WAYA WAKUZUIA MAINZI** (VENT PIPE AND FLY SCREEN)

Ni muhimu sana kulitizama tizama bomba la kutolea harufu mbaya kila mara. Hakikisha kuwa bomba ni safi na halina uchafu au utando wa buibui. Hakikisha kuwa kile kichungi (au cheke cheke) cha kuzuia wadudu kama inzi hakina na matundu makubwa yatakayo waruhusu inzi hawa kuingia au kutoka chooni kupitia bombani. Ikiwa kichungi hicho kimezeeka, basi ni heri kiondolewe na kibandikwe kipya.

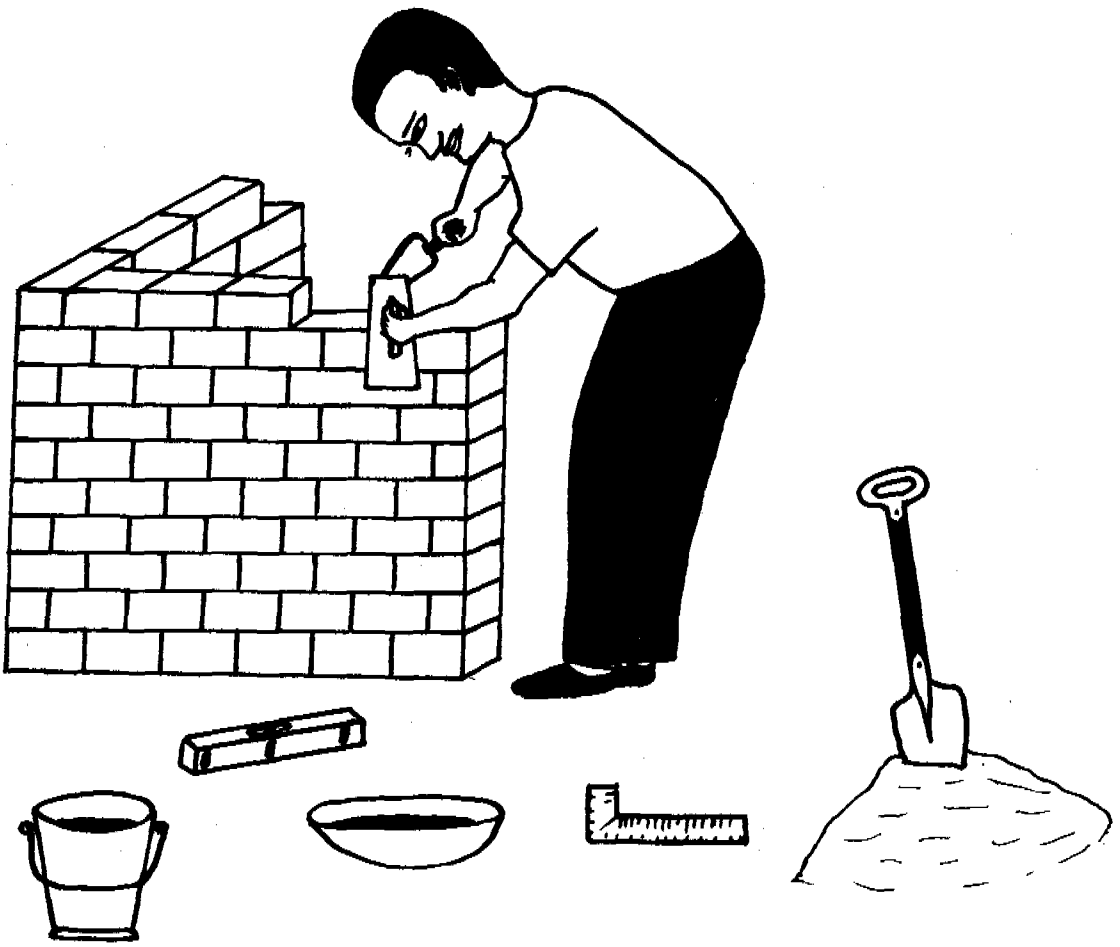
UKIWA NA SWALI AU MAONI WASILIANA NA KIWASAP, KILIFI.

UANGALIZI WA CHOO



VIFAA VYA UJENZI

KIWASAP



ELIMU YA UJENZI

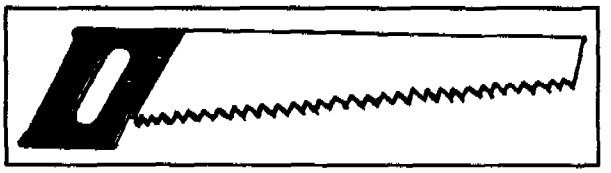
VIFAA VYA UJENZI

UTANGULIZI

Kazi yeyote ile inayohusu ujenzi ina uhitaji mkubwa wa kutumia vifaa vya kufanya kazi ile. Vifaa tofauti tofauti hutumika kulingana na kazi tofauti tofauti zinazohusika. Kuna aina ya vifaa ambavyo ni lazima vinunuliwe kwa sababu sio rahisi kivitengenezea mwenyewe hapo nyumbani, lakini kuna vifaa ambavyo ni rahisi kujitengenezea hapo nyumbani.
Vifuatavyo ndio vifaa ambavyo hutumiwa kwenye ujenzi; kama vile ujenzi wa nyumba, choo na kadhalika.

1) MSUMENO WA MBAO

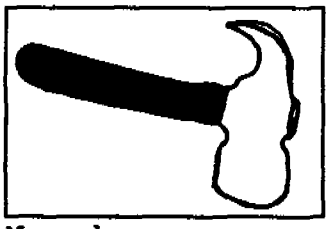
Msumemo wa mbau hutumiwa kwa kukatia vipande vya mbau. Hutumiwa sana kwa kutengenezea milango, paa na hata vibao vya kufyatulia matofali. Msumeno hauwezi kutengenezewa nyumbani.



Msumeno wa mbao

2) NYUNDO

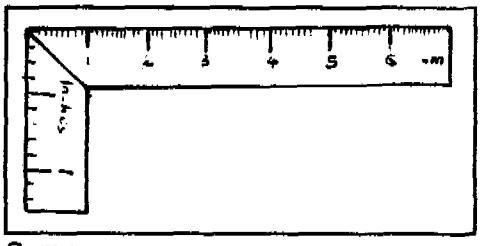
Hutumiwa sana kwa kupigilia na kun'golea misumari, haswa wakati wa kuunganya mbau au kuezeka mabati.
Nyundo yaweza kutengenezwa kienyeji ingawa ni kazi ngumu. Kifaa kama chuma chaweza kutumiwa tu kwa kupigilia.



Nyundo

3) SQUEA (T-Square)

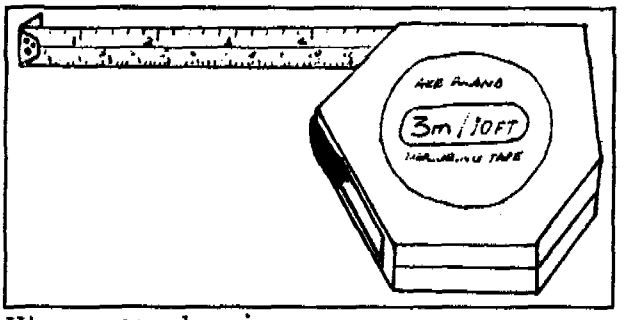
Hiki ni kifaa ambacho hutumiwa ili kutupatia pembe ya mraba. Kuna njia nyengine iitwayo "Njia ya 3-4-5-" ambao huhitaji kamba na utepu wa kupimia. Ni vizuri kuwa na "Squea"



Squea

4) UTEPU WA KUPIMA (Tape Measure)

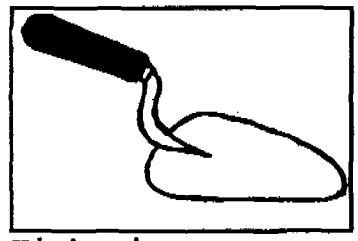
Hiki ni kifaa kinachotumiwa kwa kupimia urefu, upana au ukubwa wa vitu. Ni kifaa ambacho hutumika sana katika ujenzi. Ni vigumu sana kuweza kutengeneza tepu iliyo sahihi kwa kutumia kikamilifu. Ni heri basi ununue tepu zinazo. uzwa madukani au utumie "Rula" za watoto wa skuli.



Utepu wa kupima

5) **KICHAPIO (Trowel)**

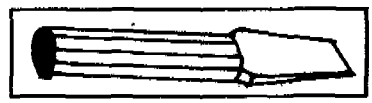
Hiki ni kifaa ambacho hutumika sana kwenye ujenzi wa kuta za nyumba. Hutumiwa sana kwa kuzibia mchanganyiko wa simiti na mchanga kwenye viungio. Pia vile vile hutumiwa sana kwa kuchapia plasta au kukandikia ukuta. Chaweza kutengenezewa nyumbani lakini huhitaji vifaa kama bati la chuma, nyundo na tindo.



Kichapio

6) **TINDO (Chisel)**

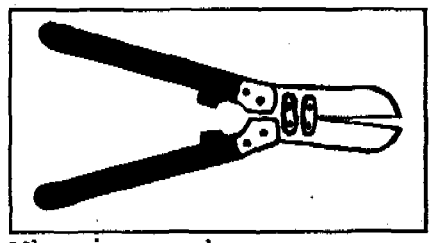
Tindo ni kafaa ambacho hutumiwa kwa kupasulia bati la chuma, waya za cheke cheke na hata vyuma vyembamba. Tindo hutumiwa pamoja na nyundo, ikiwa hakuna msumeno wa chuma.



Tindo

7) **MKASI WA CHUMA (Wire cutter)**

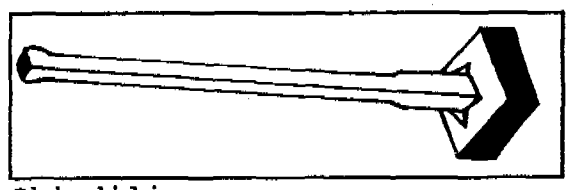
Mkasi wa chuma ni kifaa kinachotumiwa kwa kukatia waya nyembamba nyembamba ambazo ni ngumu. Hutumiwa iwapo hakuna tindo na nyundo.



Mkasi wa chuma

8) **SHINDILIA (Rammer)**

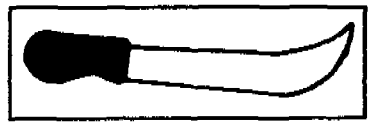
Hiki ni kifaa ambacho hutumika kwa kushindilia au kugandamiza kokoto ili kutengeneza sakafu. Hutumiwa kwa kutengenezea sakafu za nyumba au choo. Ni rahisi kutengeneza kifaa hiki kwa kutumia mbau nzito katika sehemu ya chini na kuipigilia mpini.



Shindilia

9) **PANGA (Matchet)**

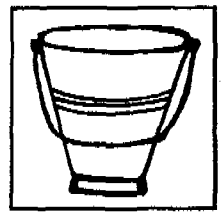
Panga ni kifaa muhimu sana ambacho hutumika kwa kukatia matawi, miti na hata kufyeka vichaka. Kisu kikubwa au jembe vyaweza kutumiwa kwa kufyekea nyasi.



Panga

10) **NDOO (Bucket)**

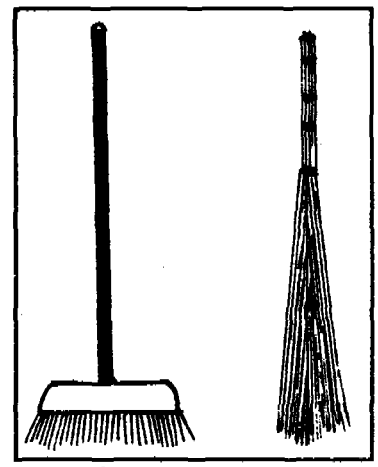
Ndoo ni kifaa ambacho hutumiwa kwa kutolea udongo ndani ya shimo linalochimbwa, au kuchotea maji. Kikapu au gunia laweza kutumiwa kwa kutolea udongo ndani ya shimo linalochimbwa, na kuvutwa juu kwa kutumia kamba.



Ndoo

11) **UFAGIO (Broom)**

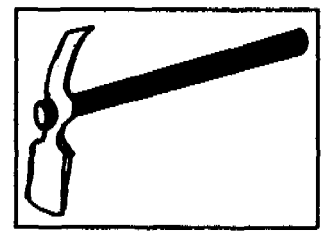
Ufagio ni kifaa ambacho hutumika sana kwa kuziondoa takataka au kufagia sakafu kama vile sakafu za nyumba au choo. Ufagio waweza kutengenezwa kwa urahisi kwa kutumia matawi ya miti, nyasi na hata mnazi; ambayo hufunganishwa pamoja kwa kutumia kamba



Ufagio

12) **JEMBE SHOKA (Mattock)**

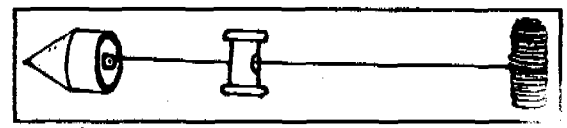
Jembe shoka ni kifaa ambacho hutumiwa sana kwa kuchimbua udongo mgumu ambao ni vigumu kuuchimba kwa kutumia Jembe. Jembe shoka lina upande wa kuchimbua na upande wa kupasua au kunyooshea shimo.



Jembe Shoka

13) **KABIRO (Plumb Bob)**

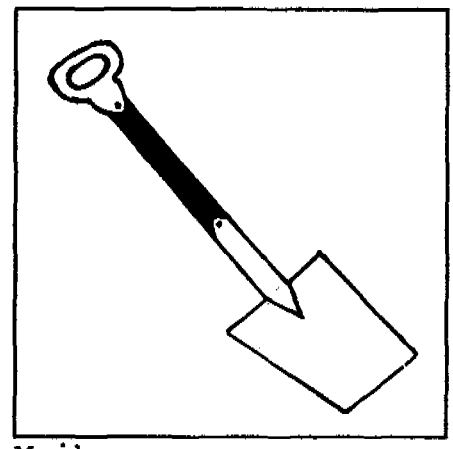
Kabiro ni kifaa muhimu sana ambacho hutumiwa sana kwenye ujenzi wa ukuta au uchimbaji wa shimo. Kazi yake ni kuufanya ukuta au shimo kuwa wima. Ikiwa hakuna kabiro ni rahisi kutengeneza kabiro nyumbani kwa kufungia kipande cha jiwe na kamba (Kamba laini)



Kabiro

14) **MWIKO (Shovel)**

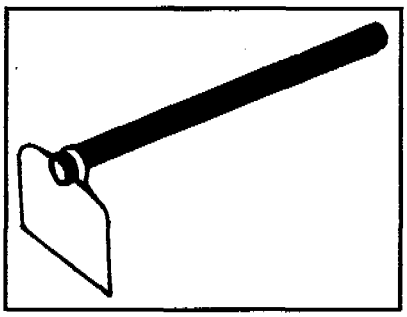
Mwiko hutumiwa sana kwa kutekea udongo, kukorogea udongo au mchanganyiko wa simiti na mchanga au kokoto. Ikiwa hakuna mwiko, basi Jembe laweza tumiwa badala yake.



Mwiko

15) **JEMBE (Hoe)**

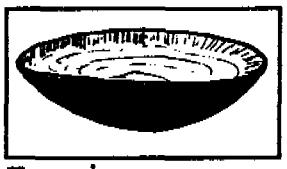
Umaarufu wa Jembe ni wa enzi ya jadi hata jadi kwani jembe ndilo hutumiwa sana kwa kulimia mashamba, na hata kuchimbulia. Ikiwa hakuna jembe la kawaida, jembe shoka laweza kutumiwa kwa kuchimbulia.



Jembe

16) **KARAI (Pail)**

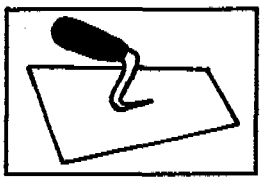
Karai hutumiwa sana kwa kuchotea maji na kupimia kiasi kinachohitajika kufanyia michanganyiko tofauti tofauti, kama vile simiti, udongo, mchanga au kokoto. Ikiwa hakuna karai karibu, ni heri kutumia sufuria.



Karai

17) **MKONO CHUMA (Steel Float)**

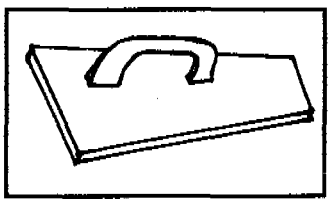
Mkono chuma hutumiwa kwa kulainisha sakafu, zinapotengenezwa. Mbau ngumu ikipigiwa randa vizuri, huweza kutumiwa kwa kutengeneza mkono bao unaoweza kutumiwa sawa na mkono chuma.



Mkono chuma

18) **MKONO BAO (Wood Float)**

Mkono bao ni kifaa ambacho hutumiwa kwa kupigia plasta ukuta au sakafu ambayo hulainishwa zaidi kwa kutumia mkono chuma. Ni rahisi kutengeneza mkono bao ikiwa kuna kipande cha mbau iliyopigwa randa na misumari ya kuunganishia kishikilio cha mkono.



Mkono bao

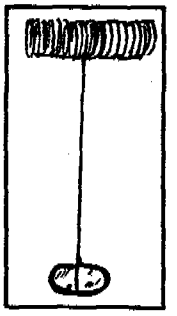
19) **PIMA MAJI (Spirit level)**

Pima maji ni kifaa ambacho ni muhimu sana kwa kusawazishia sakafu isiwe na mabonde mabonde. Pia vile vile Pima Maji hutumiwa kwa kunyoosha ukuta au shimo lisimame wima. Sio rahisi kutengeneza pima maji.

Pima maji

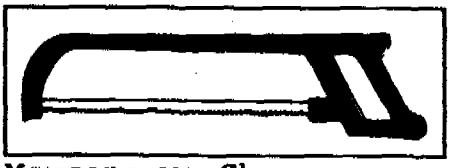
20) **KAMBA LAINI (Plumb String)**

Kamba laini ni kifaa ambacho hutengenezewa nyumbani kwa kamba ambayo hufungiwa kipande cha jiwe. Kamba laini hutumiwa kama kabiro au pima maji ili kunyoosha ukuta au shimo na kuwa wima.



21) **MSUMENO WA CHUMA (Hacksaw)**

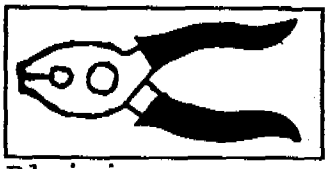
Msumeno wa chuma hutumiwa kwa kukatia vyuma. Ikiwa hakuna msumeno wa chuma ni heri kutumia tindo na nyundo au mkasi wa chuma kwa kukatia vyuma vyembamba vyembamba.



Msumeno wa Chuma

22) **PLAIZI (Pliers)**

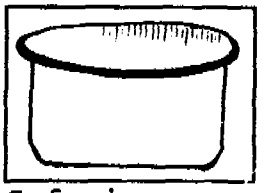
Plaizi ni kifaa kidogo ambacho ni muhimu sana kwa kukatia waya nyembamba. Hutumiwa kwa kuunganishia vyuma kwa kutumia waya, pia vile vile hutumiwa kwa kufungia waya wa cheke cheke wa kunasia wadudu ambayo hufungiwa katika sehemu ya juu ya bomba la kutolea harufu mbaya.



Plaizi

23) **SUFURIA (Pan)**

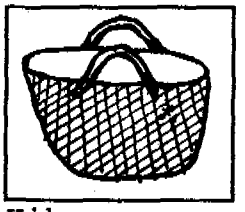
Sufuria ni chombo ambacho hutumiwa kwa kupikia. Ikiwa hakuna karai ambayo hutumiwa kuchotea maji au kupimia simiti na mchanga, ni heri kutumia sufuria.



Sufuria

24) **KIKAPU (Basket)**

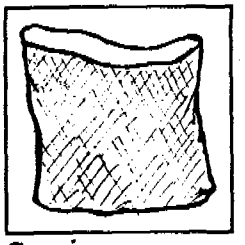
Kikapu ni chombo ambacho hutumiwa kwa kubebea vitu. Ikiwa shimo linachimbwa, na hakuna ndoo ya kutolea mchanga, ni heri kutumia kikapu ambacho hufungiwa kamba mwenye mashikio yake na kuvuta juu na kuumwaya huo mchanga.



Kikapu

25) **GUNIA (Sack)**

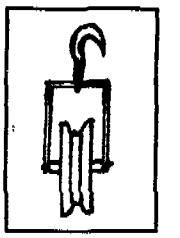
Gunia ni kama mfuko ambao hutumiwa kwa kubebea bidhaa. Gunia pia vile vile hutumiwa kwa kufunikia mjengo wa kokoto au simiti na kumwaiywa maji ili pawe na mzizimo wa muda mrefu. Ikiwa shimo linachimbwa, na hakuna ndoo au kikapu cha kutolea mchanga, ni heri kutumia gunia kwa shughuli hiyo.



Gunia

26) **RODA (Pulley)**

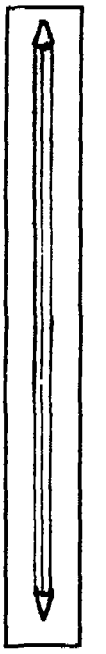
Roda ni kifaa ambacho hupitishiwa kamba na kuufanya uvutaji wa kitu kizito kutoka ndani ya shimo kuwa rahisi sana. Ni bora na salama kuwa na kifaa hiki, ikiwa shimo linachimbwa.



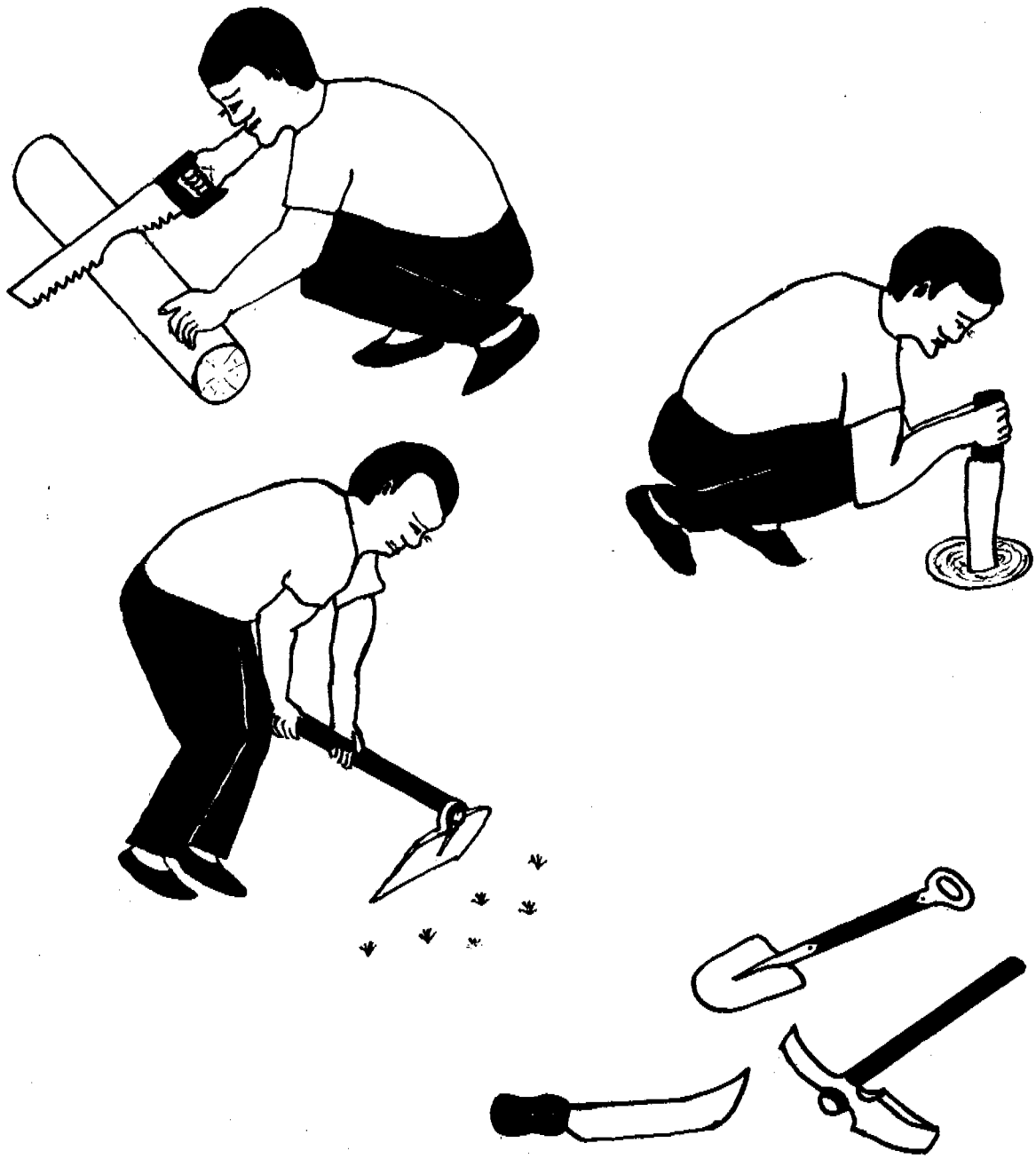
Roda

27) **MTAIMBO (Crow bar)**

Mtaimbo ni kifaa ambacho hutumiwa kwa kuchimbia mashimo. Ikiwa shimo linalochimbwa ni lembamba na nafasi iliyopo haimruhusu mchimbaji kutumia vifaa kama vile jembe au jembe shoka, basi ni heri kutumia mtaimbo. Mtaimbo humwezesha mchimbaji kuchimba shimo akiwa amesimama. Mtaimbo ni chuma kizito chembamba chenye n'cha sehemu zote mbili. Mtaimbo ni mfano wa mti mwembamba wenye urefu wa kama futi 5 hivi ikiwa. Kuna chuma cha aina hii hapo nyumbani, basi ni rahisi kujitengenezea mtaimbo wako.

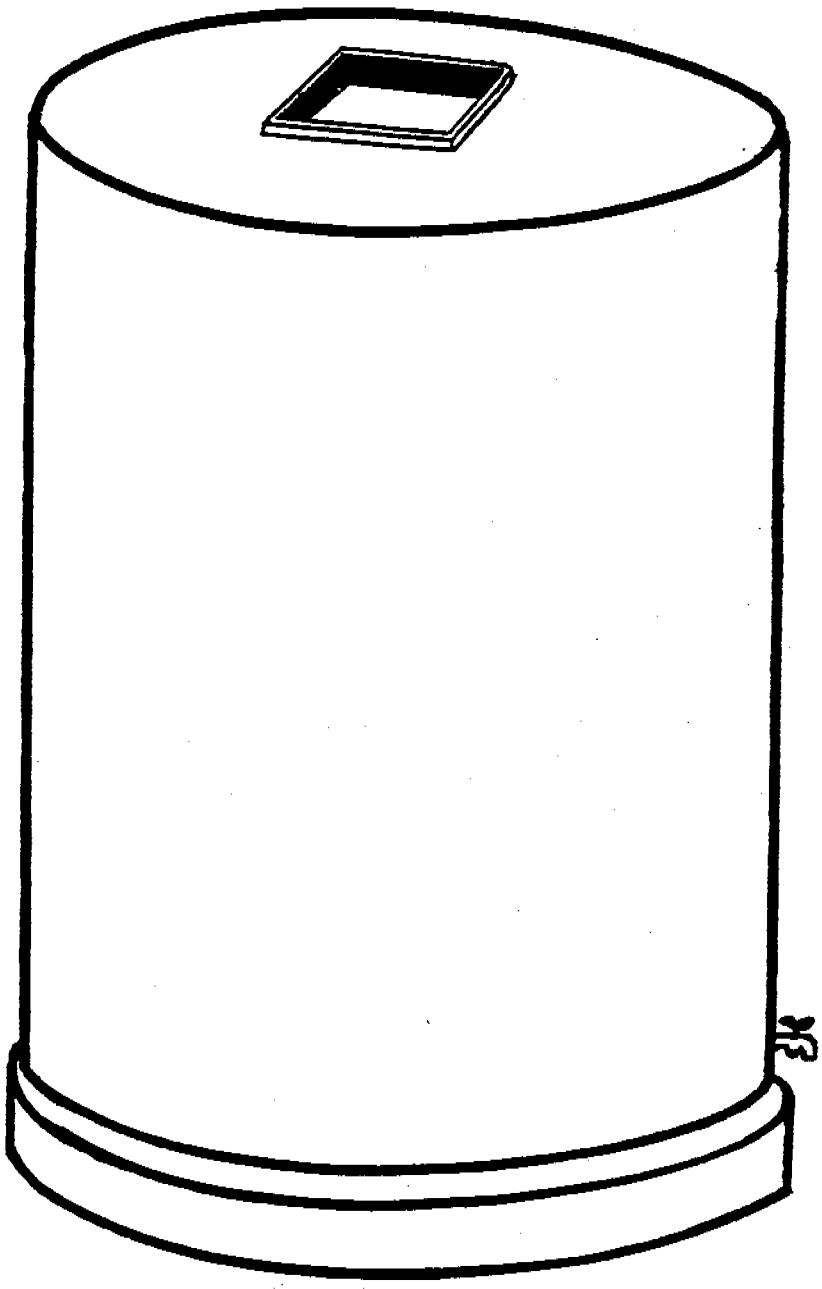


Shughuli yeyote ya ujenzi inahitaji vifaa



MAJI YA MVUA

KIWASAP



MAJI NI UHAI

ELIMU YA MAJI NA USAFI

KUKINGA MVUA INYESHAYO JUU YA PAA LA NYUMBA

UTANGULIZI

Maji ni kitu muhimu sana katika maisha yetu. Maji ni uhai.
Ukosefu wa maji ya kutosha haswa kwa matumizi ya nyumbani kama vile kunywa, kusafisha vyombo na hata kuoga, waweza kusababisha madhara mengi hatari kama vile eunezaji na uambukizaji wa magonjwa mbali mbali.
Kuna sehemu ambazo zimebarikiwa kuwa na maji yanayopatikana kwa urahisi sana. Lakini kuna sehemu nyengine ambazo hazikubarikiwa kuwa na maji. Wakaazi wa sehemu hizi hupata taabu sana kwani huwabidi kusafiri mwendo mrefu sana ili kupata maji. Maji hayo pia vile vile huwa si masafi.
Kitendo hiki huwapotezea kina mama muda mwingi ambao ungelitumiwa kwa kazi za nyumbani.
Ni bora sana ikiwa maji yataweza kupatikana karibu na nyumbani na maji hayo yawe ni masafi.
Njia mojawapo ya kujipatia maji masafi nyumbani ni ile ya kuyanasa maji ya mvua kupitia kwenye paa la nyumba na kuyahifadhi mwenye tangi.

UMUHIMU WA KUNASA MAJI YA MVUA PAANI

Hizi ndizo faida za kuyahifadhi maji ya mvua;

1. Ubora wake ni wa hali ya Juu sana
2. Maji hayo yaweza kukingwa hapo hapo nyumbani
3. Vifaa na bidhaa za ujenzi wake hupatikana kwa urahisi
4. Ujenzi wake sio wa kutatiza
5. Utunzaji wake ni rahisi
6. Maji hayo huwa ni ya karibu

Hata hivyo ni vyema ifahamike kwamba ujenzi wa vifaa kama tangi la kuhifadhia maji una gharama zake. Pia vile vile wingi wa maji yatakayohitajika kuhifadhiwa utategemea sana na ukubwa wa paa la nyumba, tangi la kuhifadhia maji na wingi wa mvua inayonyesha mahali hapo.

MASWALA KUHUSU UJENZI

Kuna maswala matatu muhimu, ambayo yanahusu ujenzi wa kingo ya maji ya mvua, nayo ni; vifaa na bidhaa, pale pahali pa ujenzi, na taratibu za ujenzi.

a) <u>VIFAA NA BIDHAA ZA UJENZI</u>

Tukiwa na matumaini kuwa hapo nyumbani pana nyumba iliyo na paa bora, haswa paa la bati, au vigae ambalo litafaa kwa ukingaji wa maji ya mvua, bidhaa na vifaa vitakavyo orodheshwa hapa ndio ambavyo vitakavyotumiwa kwa kujengea tangi la kuhifadhia maji na pia vile vile kutengenezea vielekezo vya maji ya mvua kutoka mwenye paa hadi tangini (Gutters):

Miiko, vichapio, mikono bao, karai, majembe, vishindilio, kifaa cha kukatia waya, na nyundo, ndio vifaa ambvyo vitakavyotumika katika ujenzi huu. Simiti, mchanga wa changarawe, kokoto, mapande ya mawe, waya za chekecheke (weld mesh, chicken mesh), kipande cha mfereji wa bomba la chuma, kifaa cha kufungulia na kufunga maji, waya za kuunganishia chekecheke (binding wire) magunia mabovu, na maji.

Wingi au kiasi cha bidhaa au vifaa vitakavyotumika havijaelezwa, kwa sababu wingi wake

unategemea na ukubwa wa tangi litakalotarajiwa kujengwa.

b) **PAHALI PA KUJENGA**

Kuchagua pahali sawa pa kujenga tangi la kuhifadhi maji ni jambo la kufanywa kwa maakini sana. Yafuatayo ni maelezo yatakayotuongoza katika kuchagua pahali sawa pa kufanyiwa ujenzi.

1) Pahali patakapojengwa tangi (tank) pawe hapatazuia upanuzi wa ujenzi wa nyumba baadaye.
2) Pahali hapo pawe karibu na nyumba
3) Pahali hapo pasiwe karibu sana na choo
4) Paa litakalotumika liwe ni la nyumba ya kudumu
5) Nyumba zenye paa za vigae au mabati ndio bora zaidi

Baada ya kutayarisha bidhaa na vifaa vya ujenzi, pia vile vile baada ya kuchagua pahali sawa pa ujenzi, kazi halisi ya ujenzi huwa tayari kuanzwa. Ufuatawo ndio utaratibu wa ujenzi.

c) TARATIBU ZA UJENZI

Ujenzi wa tangi la kuhifadhia maji ndio huanzwa. Baada ya tangi kumalizika, mabamba ya kuelekeza maji tangini hukunjwa na kupigiliwa kando kando ya pembe za paa. Hata hivyo taratibu za ujenzi ni kama zifuatazo.

i) Shimo la msingi huchimbwa kama futi moja chini ya ardhi
ii) Mapande ya mawe hushindiliwa hadi inchi 8 (8")
iii) Sehemu iliyobaki ijazwe mchanga uliochanganywa na simiti hadi inchi 6 zaidi juu ya ardhi. Wakati msingi unapokauka, waya za chekecheke huviringwa na kufanywa umbo la tangi, umbo la mviringo. Umbo hili hulazwa juu ya msingi na kuchapiwa simiti pande zote mbili, yaani, ndani na nje. Kipande cha mfereji huvishwa kwenye sehemu ya chini ya tangi na kuchapiwa na mchanganyiko huo huo wa simiti na changarawe, machanganyiko ni 1:6 moja simiti kwa sita changarawe. Kwa juu huacha nafasi (au mlango) ambayo hata mtu anaweza kuingia au kutoka. Nafasi hii hii pia ndio hutumika kwa kupitisha maji ya mvua hadi tangini.

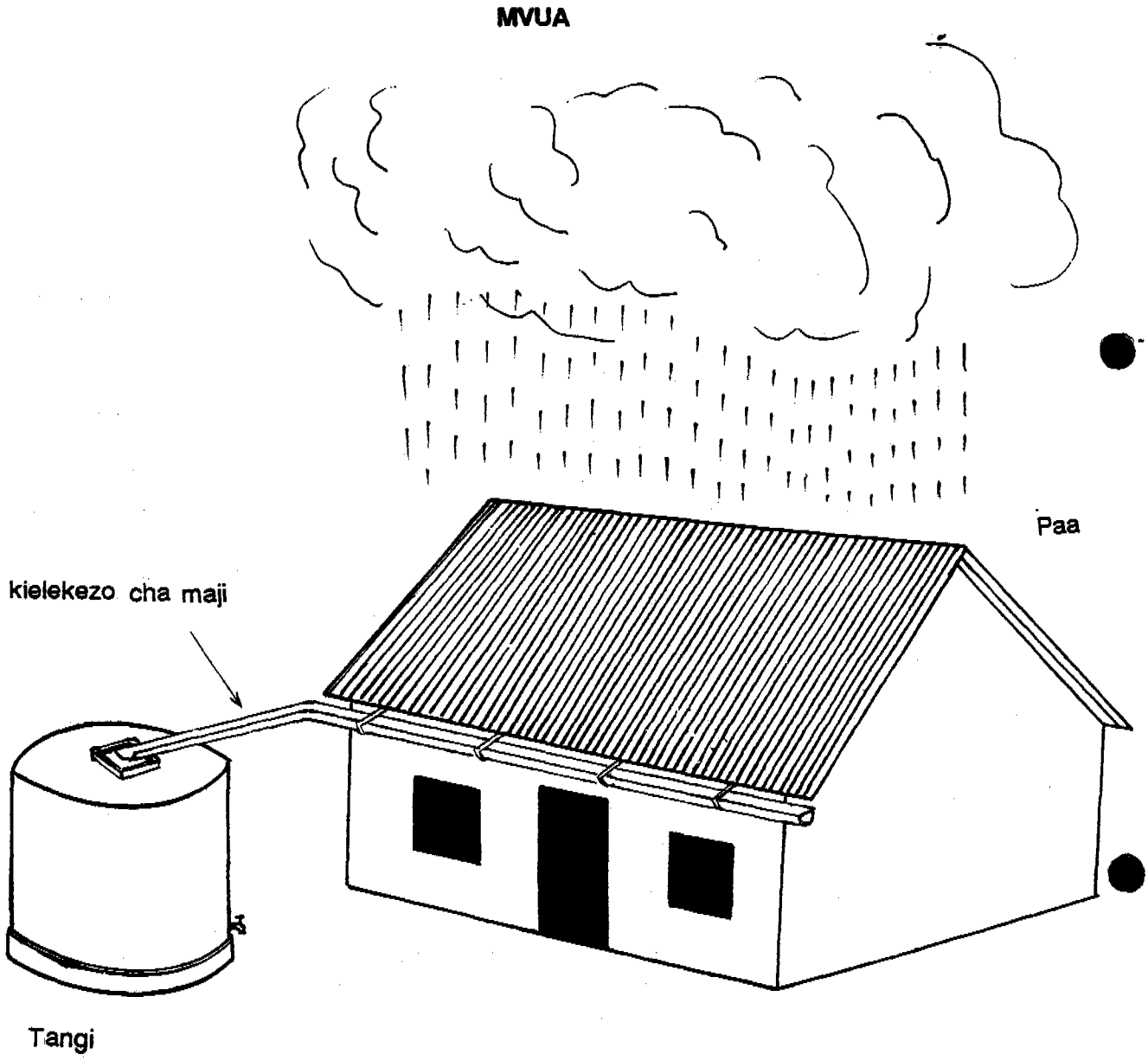
Baada ya uchapiaji plasta kwisha, tangi hupewa mzizimo wa maji kwa kutumia magunia mabovu ambayo hufunika tangi na kumwaiwa maji kwa muda usiopungua wiki mbili.

MAANGALIZI

Maji ya mvua ni masafi na hayana madhara. Hata hivyo pasipokuwa na matunzo na uangalizi unaofaa, basi maji haya huchafuka na hata huweza kuwa na madhara kiafya. Yafuatayo ni maelezo muhimu yanayohusu uangalizi bora.

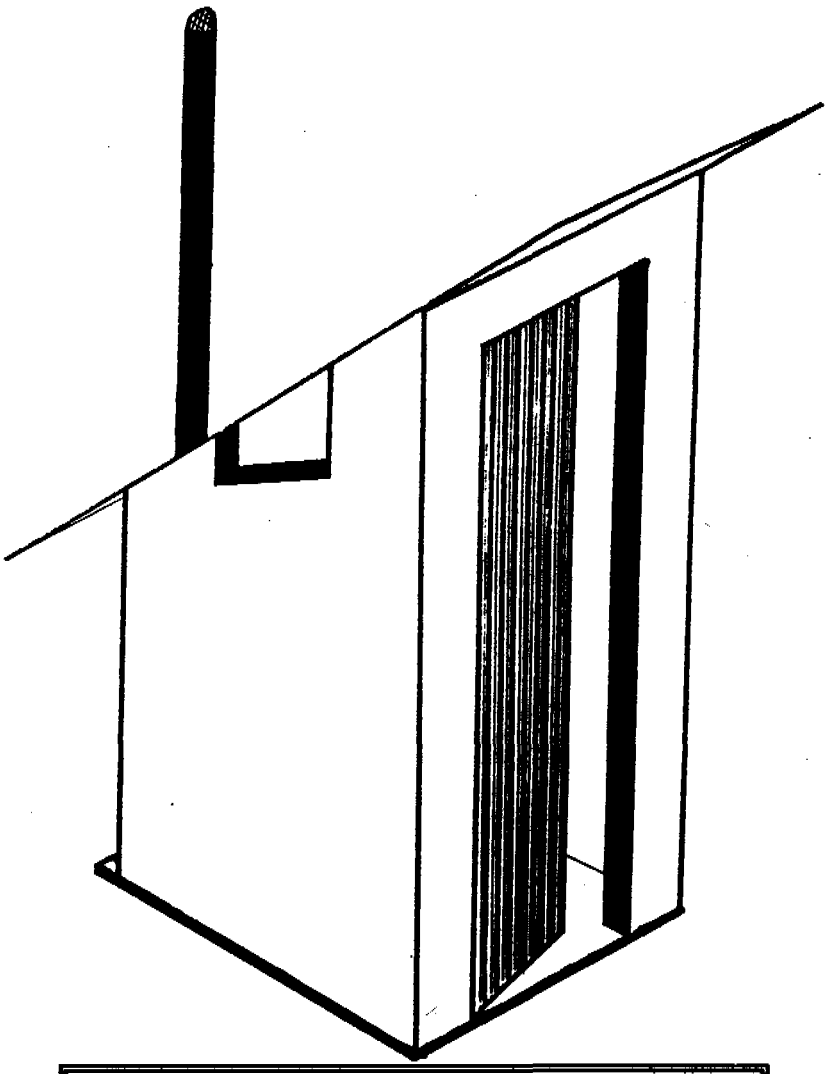
1) Hakikisha kwamba tangi linafunikwa vizuri ili kuzuia vumbi na uchafu wa aina yeyote kuingia. Pia vile vile mbu wasiweze kuingia na kuzaana humo ndani
2) Wakati wa kiangazi, paa hukusanya vumbi nyingi, ni vizuri basi kuhakikisha kwamba ile mvua ya mwanzo isiruhusiwe kuingia tangini na paa lisafishwe vizuri.
3) Ikiwa nyufa zitajitokeza mwenye ukuta wa tangi, ni bora zizibwe kwa haraka.
4) Kile kifaa cha kufunga na kufungulia maji kirekebishwe mara tu kinapoonyesha dalili za kuvuja
5) Maji yatumiwe kwa hali ya uangalifu ili yasimalizike kabla ya kipindi cha kiangazi kwisha.

UKIWA NA SWALI AU MAONI WASILIANA NA KIWASAP



CHOO IMARA CHENYE HEWA SAFI
(V.I.P. - LATRINE)

K I W A S A P



ELIMU YA MAJI NA USAFI

CHOO IMARA CHENYE HEWA SAFI
V.I.P. LATRINE

UTANGULIZI

Ni jambo la muhimu sana kuwa na vyoo manyumbani mwetu, tukifahamu kwamba maradhi mengi sana yanayotukumba yanahusiana sana na vinyesi vinavyotupwa ovyo ovyo kwa kutokutumia vyoo manyumbani mwetu.

Magonjwa ya tumbo, kuhara, na hata minyoo, ni baadhi ya aina ya magonjwa yanoyatupata ikiwa hatutumii vyoo manyumbani.

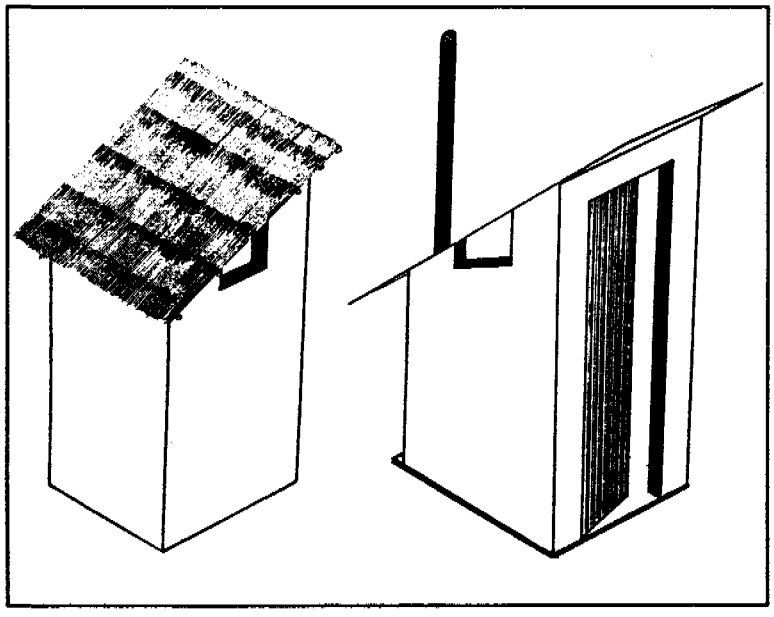
Wadudu, maji na hata upepo husaidia kusambaza viini, ambavyo baadaye huwafikia watu na kuwaambukiza magonjwa hayo.

Kuna aina nyingi sana ya vyoo ambavyo vinaweza kujengwa, kwa mfano, kuna aina ya vyoo ambavyo hujengwa mijini pekee, na kuna aina nyengine ya vyoo ambavyo hujengwa katika sehemu za mashambani.

Hapa tutazungumzia juu ya choo ambacho kinafaa zaidi kutumika katika sehemu za mashambani; choo hiki ni kile kinacho julikana kama **Choo Imara Chenye Hewa Safi** (Ventilated Improved Pit Latrine).

TOFAUTI YA CHOO CHA KIENYEJI NA CHOO IMARA CHENYE HEWA SAFI

1. Vyoo vya kienyeji hujengewa sakafu ambayo baada ya muda mfupi huoza na kubomoka au ikiwa saruji au simiti ilitumiwa basi choo hicho kikishajaa sakafu hiyo hubidi ivunjwe, kitendo kiletacho hasara. Lakini choo imara chenye hewa safi hutengenezewa sakafu za vifuniko ambavyo ni vigumu sana, na baada ya choo



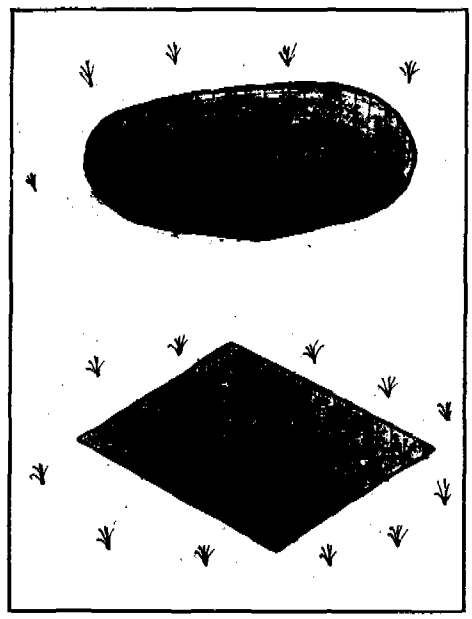
kujaa, vifuniko hivyo huondolewa na kutumika tena.

2. Vyoo vya kienyeji havijengewi misingi ya ukuta katika sehemu za juu ya shimo, kitendo ambacho husababisha maporomoko ya udongo shimoni hadi choo kudidimia. Choo imara chenye hewa safi hujengewa kuta hizi na maporomoko hayafanyiki.

3. Vyoo imara vyenye hewa safi hutiwa bomba la kutolea harufu mbaya na juu ya bomba hili hufungiwa kichungi cha kuwanasa wadudu kama vile inzi.
Vyoo vya kienyeji havina bomba la kutolea harufu mbaya na kile kichungi cha kuwanasia inzi. Hili ndilo jambo ambalo linavifanya viwe na harufu mbaya na mainzi wengi huwa na uhuru wa kuingia chooni na kutoka hadi manyumbani mwetu, na kutuambukiza magonjwa hatari.

SEHEMU MUHIMU ZA CHOO IMARA CHENYE HEWA SAFI, NAMNA ZINAVYOFANYA KAZI, NA TARATIBU ZA UJENZI WAKE.

A SHIMO



Shimo ni sehemu moja ya choo, ambayo ni muhimu sana. Shimo ndilo ambalo hupokea na kuweka vinyesi na mikojo.

Kuna sehemu fulani ambazo watu wamezoea au hupendelea sana kuchimba shimo la duara au mviringo, na kuna sehemu nyengine pia vile vile ambazo watu hupendelea sana kuchimba shimo lenye pembe nne za mraba.

Hata hivyo ni muhimu sana mashimo ya mviringo au duara kusisitizwa zaidi, kwa sababu mashimo haya si rahisi kuporomoka na pia vile vile mashimo haya hudumu kwa muda mrefu sana, kwani huwa ni timamu zaidi.

Urefu wa shimo litakalochimbwa hutegemea sana na idadi ya watu watakaotumia choo hicho, muda ambao ungependelewa choo kidumu, eneo la upana wa shimo la choo, na vifaa vitakavyotumiwa kusafishia tako baada ya kujisaidia. Shimo hubidi lichimbwe refu zaidi ikiwa:-

a) Idadi ya watu watakaotumia choo ni wengi

b) Muda wa kudumu kwa choo ni mrefu. Inapendekezwa kuwa kipangiwe kudumu kwa muda usiopungua miaka 10 (kumi)

c) Vifaa vigumu vigumu kama vigunzi, mawe, na zaidi vitatumika kwa kujisafishia tako baada ya kujisaidia.

UJENZI

Si lazima mtu awe fundi ili aweze kuchimba shimo la choo. Vifaa vifuatavyo ndivyo hutumiwa na mchimbaji.

i) Upimaji — Utepe wa kupimia, kamba, vigingi vya mti, kifaa cha kupigilia vigingi na "squea"

ii) Uchimbaji — Jembe, tarimbo au sururu, mwiko, ndoo au karai

iii) Utoaji udongo — Kamba nzito ya kuvutia ndoo, kifaa chenye kuzunguka (roller)

- Sehemu za juu juu ya shimo hujengewa ukuta na kusababisha sehemu hiyo kuchimbwa pana zaidi kwa kama milimita 300 zaidi ya upana wa kifuniko, ili ukuta huo uweze kujengwa. Sehemu hii iliyopanuliwa zaidi huchimbwa hadi kufikia udongo ulio timamu.
- Shimo ni lazima linyooke vizuri, na kuwa wima
- Uchimbaji usifanywe katika sehemu za chini ya ukuta ujengwao kwenye sehemu za juu juu ya shimo

Vipimo vinavyotumika ni kama ifuatavyo:-

Shimo la duara - Milimita 1500

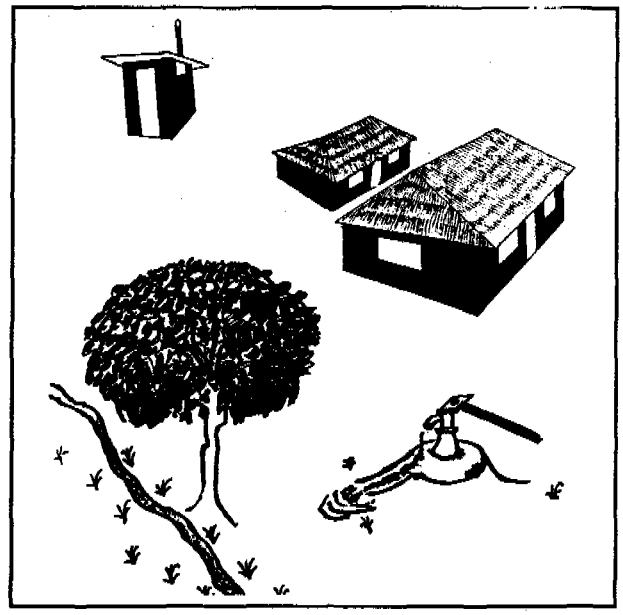
Shimo la pembe nne - Milimita 1500 kwa milimita 1100

Ni sharti shimo lichimbwe kwa kama

i) mita 30 kutoka kwenye chanzo chochote cha maji,

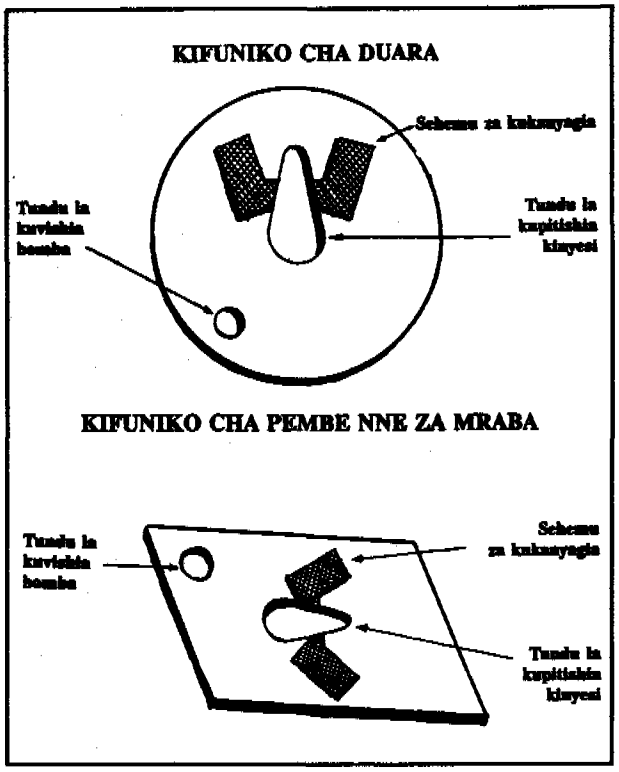
ii) mita 6 kutoka kwenye nyumba ya kuishi na pia vile vile upepo usielekee upande wa nyumba ya kuishi

iii) Shimo lichimbwe hadi kufikia mita 1 1/2 kabla ya kutoboa maji.



kuvunjika na sakafu hiyo pamoja na jengo kudidimia shimoni. Kitendo hiki kimekuwa hatari sana kwa waliovitumia, pia vile vile cha hasara. Sakafu hizi za udongo zimekuwa na shida ya kufagiliwa vizuri au kuoshwa kwa kutumia maji, kitendo ambacho kimetusababishia uenezaji wa magonjwa mbali mbali kupitia kwa mainzi na hata kwa wanaotumia kwa kukanyaga sakafu hizo ambazo ziliambukiza magonjwa yaletwayo na minyoo.

Ili kuzuia hasara hizo, na uenezaji wa magonjwa hatari, ujenzi mpya wa choo imara chenye hewa safi umetokea. Ujenzi huu unahusisha sana utengenezaji wa SAKAFU YA KIFUNIKO (SQAUTTING SLAB).



UJENZI

Ujenzi wa sakafu ya kifuniko wamhitaji fundi mwashi na msaidizi wake.

Bidhaa na vyombo vinavyohitajika kwenye ujenzi huu ni kama ifuatavyo;

(i) Vyombo; mwiko, karai, kijiko cha kuchapia, mkono bao, mkono chuma, patasi, au msumeno wa chuma, nyundo, misumari 3" na 1 1/2", msumeno, squea, utepu wa kupimia, na kipigilio.

(ii) Bidhaa za ujenzi; simiti, mchanga wa changarawe, kokoto, maji, karatasi ya plastiki.

Ikiwa shimo litakalochimbwa ni la duara, basi sakafu ya kifuniko cha duara kitahitajika. Ikiwa shimo litakalochimbwa ni la pembe nne mraba, basi sakafu ya kifuniko chenye pembe nne mraba kitahitajika.

Ujenzi huanza kwa kutengeneza vibao ambavyo kokoto humiminwa ndani yake na kutupatia umbo la kifuniko. Vibao hivyo hutengenezwa kwa kutumia mbao, na kuunganishwa kwa misumari.

Kifuniko hutengenezwa kwa kutumia konkreti ambayo ni mchanganyiko wa simiti karai = 1, mchanga wa changarawe karai = 2, na kokoto karai = 3.

Ili kukiongezea kifuniko ugumu mwingi zaidi, vyuma au waya za chuma hutumiwa pia. Vyuma hivi humiminiwa kokoto, na kufunikwa kabisa, ili kuvizuia vyuma hivyo visishike kutu.

Vifaa muhimu hutumiwa kwa kutengenezea tundu la kupitishia kinyesi na mikojo, na tundu la kuvishia bomba la kutolea hewa chafu. Sehemu za kukanyagia, pia hutengenezwa katika sehemu za juu ya kifuniko. Sehemu ya sakafu hulainishwa sana kwa kutumia mkono chuma.

- Baada ya kifuniko kutengenezwa, umuwaiaji wa maji huanzishwa siku ya pili na

kuendelea kwa muda usiopungua wiki mbili hadi siku ishirini na nane.

KIWASAP inatengeneza vifuniko vya duara vyenye upana wa milimita 1240 pia vile inatengeneza vifuniko vya pembe nne za mraba vyenye urefu wa milimita 1240 na upana wa milimita 850.

Kuna manufaa mengi yapatikanayo kwa kutumia sakafu za vifuniko.

i) Ni rahisi kuosha na kufagia kifuniko. Hali hii inapunguza sana uenezaji wa magonjwa yaletwayo na minyoo.

ii) Choo kikishajaa kifuniko huondolewa na kutumiwa kwenye choo kingine tena na tena.

iii) Kifuniko ni chepesi kubebeka.

iv) Hasara za kubomoka au kuvunjika kwa kifuniko hazipatikani.

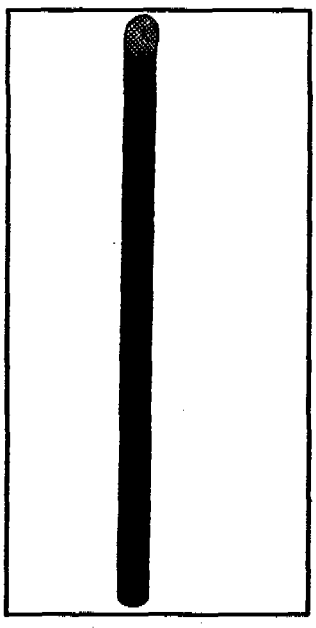
v) Kifuniko chaweza kutengenezwa nyumbani na vifaa vinavyopatikana humo humo.

D BOMBA LA KUTOLEA HARUFU MBAYA NA KICHUNGI CHA KUNASIA WADUDU

Bomba la kutolea harufu mbaya ni sehemu nyengine maalum pia ambayo hutofautisha choo cha kienyeji na choo imara chenye hewa safi.

Si jambo la kushangaza kabisa kufahamu kwamba watu wengi wamekuwa wakijenga vyoo haswa vile vya kienyeji na baada ya muda mfupi, watu hao wakakataa kabisa kutumia vyoo hivyo kwa sababu ya harufu mbaya, na mainzi wengi waliosumbua chooni. Pia vile vile mainzi hawo walikuwa hatari sana kwani walirudi manyumbani na kuwaambukiza magonjwa mbali mbali baada ya kutua mwenye vyakula vyao.

Ujenzi wa choo imara chenye hewa safi unahusisha utumizi wa bomba la kutolea harufu. Bomba hili pia vile vile husaidia kwa kuwanasa mainzi ambao hupenda kutoroka kwa kupitia bombani. Mwanga unaotoka angani na kupitia bombani hadi shimoni ndio ambao huwavutia mainzi na kuwafanya watoroke kupitia mwenye bomba. Mara hapo mainzi hawo wanapofika juu ya bomba, ambapo kichungi au cheke cheke iifungwa, mainzi hawo hunaswa na huwa hawawezi, kuondoka hapo juu hadi kifo chao, na kutumbukia shimoni tena.



Bomba la plastiki, au mjengo wa mawe ni baina ya vifaa vinavyotumika kwa kutengenezea sehemu hii ya kutolea harufu mbaya. Bomba lisipungue milimita 100. Mjengo wa mawe usipungue milimita 225 x 225 mraba.

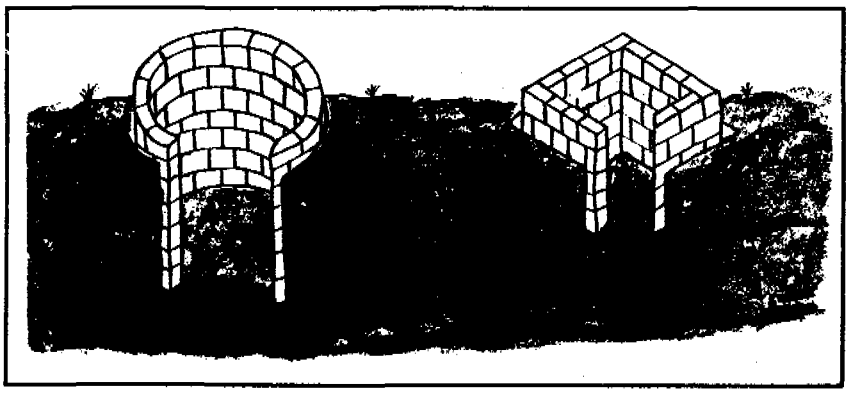
B UKUTA UJENGWAO KATIKA SEHEMU ZA JUU YA SHIMO "LINING"

Ukuta ujengwao katika sehemu za juu ya shimo au "lining", ni sehemu nyengine muhimu sana ambayo hutofautisha choo imara chenye hewa safi na choo cha kienyeji.

Choo cha kienyeji hakijengewi kuta hizi. Ni jambo la kuhuzunisha sana, kufahamu kwamba watu wengi sana wamepata hasara kubwa kwa kuporomokewa na vyoo vyao, haswaa wakati wa msimu wa mvua.

Vyoo vinapoporomoka huwa ni hatari sana, kwani huweza pia kusababisha hata kifo kwa wanao vitumia, kuporomokea shimoni.

Madhara haya yamekumba sana vyoo vya kienyeji, ambavyo ujenzi wake haukutilia maanani hali za ugumu wa udongo ardhini. Maporomoko ya vyoo vya kienyeji hutokea kwa sababu, sehemu za juu juu ya ardhi wakati mwengine huwa na udongo ulio mororo sana, ambao huwa nivigumu sana kustahimili uzito wa paa na jumba la choo utakaouelemea. Shida hii mara nyingi hutokea haswa wakati wa mvua ambayo husababisha mzizimo ardhini.



Njia ya ujenzi wa choo imara chenye hewa safi humaliza shida hii, kwa sababu sehemu hii ya juu juu ya shimo iliyo nyororo, hujengewa ukuta (lining). Ukuta huu pia vile vile huwa kama Msingi kwa kuzuia uzito wa jumba la choo na pia vile vile kifuniko (slab) hulazwa na kuegemea juu ya ukuta huu.

UJENZI

Ujenzi wa ukuta huu wamuhitaji mtu alie na ujuzi wa kujenga kama vile Fundi Mwashi (Mason), pamoja na msaidizi wake. Vifaa na vyombo vinavyo hitajika ni kama vifuatavyo:-

i) <u>Vyombo;</u>

Kijiko kidogo cha kuchapia, mkono bao, kabiro, utepe wa kupimia, kamba nyembamba ya kupimia, vigingi, kifaa cha kupigilia vigingi, "T-squea", mwiko, na karai

ii) <u>Bidhaa za Ujenzi;</u>

Bidhaa zifuatazo zaweza kutumika kwa kujengea kuta hizo.

Matofali ya mawe, matofali ya konkreti, mapande ya mawe, matofali yenye mchanganyiko wa udongo na simiti (stabilised soil blocks), miti migumu isiyoliwa na

mchwa, au plasta ya mchanga ulio changanywa na simiti, na kadhalika, hutumiwa kwa kujengea kuta hizi. Hata hivyo, bidhaa zisizo oza au kuharibika haraka zafaa zitumiwe. Ni vyema sana ikiwa bidhaa hizi zitapatikana humo humo mitaani mwetu.

Vipimo vilivyotumiwa hapo mwanzo; yaani milimita 1500 kwa shimo la mviringo na milimita 1500 kwa milimita 850, kwa shimo lanye pembe nne za mraba, ndivyo hupimwa juu ya ardhi. Kufuatia vipimo hivi shimo huchimbwa hadi kufikia sehemu ya ardhi iliyo na udongo timamu. Mara udongo timamu unapofikiwa, ujenzi wa kuta unaweza kuanzwa. Ikiwa shimo ni la duara, ingia ndani ya shimo na upime sehemu itakayojengewa ukuta, kwa kupima duara yenye upana wa milimita 1040. Ikiwa shimo ni la pembe nne za mraba, ingia ndani ya shimo na upime sehemu itakayojengewa ukuta, kwa kupima milimita 1040 kwa milimita 700. Katika sehemu ya nje ya vipimo hivyo kuelekea ukutani ndipo ukuta wa matofali utakapojengewa. Katika sehemu ya ndani ya vipimo hivyo, ndipo shimo la choo litakapochimbwa.

Tumia mchanganyiko wa simiti karai moja na changarawe karai tano; kwa kuunganishia matofali.

Kila mara hakikisha kwamba:-

i) Ukuta unaojengwa umenyooshwa vizuri na kuwa wima,

ii) Ukuta unajengwa hadi milimita 150 zaidi juu ya ardhi

iii) Sehemu zenye mwanya wa shimo pembeni mwa ukuta zimejazwa udongo na kushindiliwa sana.

iv) Ikiwa ukuta una kina kirefu sana, basi nafasi zitaachwa pembeni mwa ukuta ili kuruhusu maji maji na mikojo kudidimia mchangani.

C SAKAFU YA KIFUNIKO (SLAB)

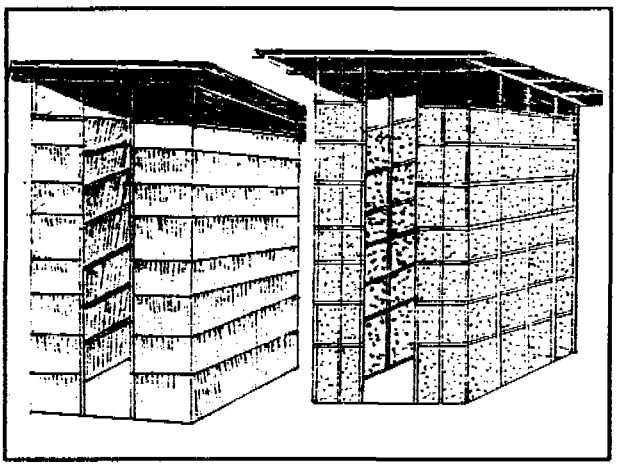
Sakafu ya kifuniko (slab) ni sehemu nyengine muhimu sana kwenye choo ambayo ina shimo la kunyelea, sehemu za kukanyagia na tundu la kuvishia bomba la kutolea harufu mbaya. Ni jambo la kusikitisha sana kufahamu kwamba tangu zamani, ujenzi wa sakafu za vyoo vyetu umekuwa ni wa hasara na gharama nyingi na pia vile vile umekuwa hatari sana. Sakafu za vyoo hivyo vya kizamani zimekuwa zikiporomoka na kutumbukia shimoni ovyo-ovyo licha ya kuwa, sakafu za vyoo hivyo pia zimesaidia sana kutuenezea magonjwa mbali mbali haswa yale ya minyoo.

Kwa sababu sakafu hizo hazikuweza kusafishika kwa kutumia maji, sakafu hizo zimekuwa zikijengwa kwa kutumia magogo ambayo yalipangwa toka upande mmoja hadi mwengine wa shimo la choo. Baada ya kupangwa vizuri, magogo hayo yalimwaiwa udongo (au simiti kwa wale walioweza) na kuacha kijishimo cha kupitishia kinyesi.

Hatari iliyokuwepo ni kwamba magogo hayo hayakuchukua muda mrefu kabla ya kuoza,

E	MJENGO

Mjengo ni sehemu nyengine muhimu sana kwenye choo ambayo humwezesha mtu kutumia choo kwa siri bila kuonekana. Pia vile vile mjengo humkinga anayekitumia kutokana na hali ya anga kama vile jua kali, mvua, upepo, baridi au vumbi. Mjengo unahusisha ujenzi wa ukuta milango na paa.



Kuta za mjengo zinaweza kujengwa kutumia vifaa na bidhaa zinazopatikana humo humo mitaani, na njia za ujenzi zinazofahamika na wenyeji zitumiwe. Ukuta unaweza kujengwa kwa kutumia miti na udongo, mawe, matofali ya udongo uliochanganywa na simiti, makuti na kadhalika. Paa laweza kujengwa kwa kutumia mabati, makuti, nyasi, na kadhalika.
Milango yaweza kutengenezwa hata kwa kutumia makuti.
Hata hivyo kuna njia ambayo mjengo unaweza kujengwa bila kuweka mlango na mtu aweze kujisaidia haja zake bila ya kuonekana.

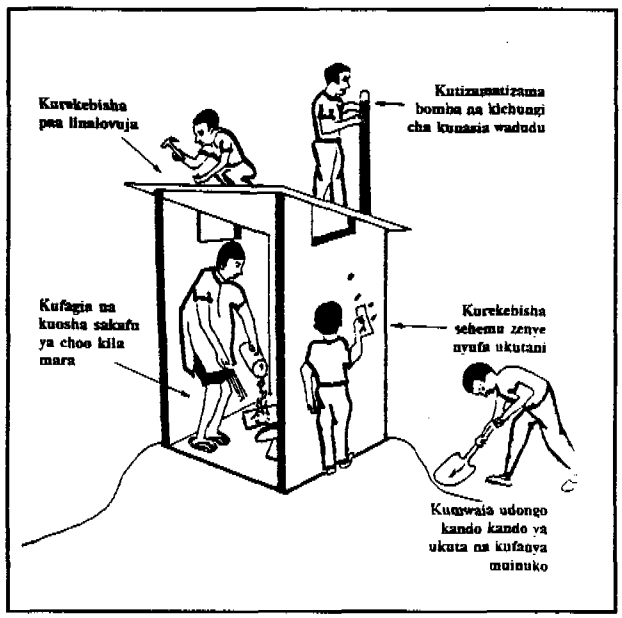
F	UANGALIZI WA CHOO

Baada yo choo kukamilika kujengwa, huo sio mwisho wa mambo. Utumiaji mzuri na utunzaji wa choo chako ni muhimu sana. Choo cha aina yeyote ile ni lazima kiangaliwe kila mara na kurekebishwa rekebishwa sehemu ambazo zinazokuwa na hitilafu. Zifuatazo, ndizo sehemu za choo ambazo zinahitaji sana maangalizi ya kila mara.

i) <u>Kando kando ya msingi wa choo.</u>
Vyoo vingi sana vimekuwa vikibomoka na kudidimia shimoni kwa sababu zile sehemu za kando kando za msingi hazikujazwa udongo vizuri ili kuzuia maji ya mvua yasipenye na kudidimia hadi msingini. Kwani yanapopenya, maji hayo huufanya udongo kuwa mororo sana na kusababisha maporomoko. Hakikisha kuwa unamwaia udongo na kufanya muinuko kando kando ya ukuta wa choo. Panda nyasi za ukoka penye muinuko huo.

ii) Shimo la choo

Shimo lisipotumiwa kwa hali ya uangalifu, hujaa haraka sana. Shimo hujaa haraka ikiwa vitu vigumu vigumu sana, kama vigunzi vya mahindi, mawe, maganda ya miwa, tembe za maembe, chupa, mikebe na kadhalika, vitatupwa chooni. Sabuni kali kali au sumu huwaua vijidudu na viini ambavyo hula kinyesi na kusaidia kupunguza sana idadi ya kinyesi hicho chooni. Ni vizuri sana kumwaia majivu ndani ya choo. Majivu husaidia kupunguza harufu mbaya na pia vile vile hufanya kinyesi shimoni kuwa maji maji, hali ambayo hufurahiwa sana na vijidudu vinavyokula kinyesi.



iii) Sakafu ya choo

Sakafu ya choo huleta harufu mbaya sana chooni na hata kukaribisha mainzi ikiwa haifagiliwi na kuoshwa vizuri kila mara.

Minyoo huambukizwa kwa kukanyaga sakafu chafu. Mainzi pia hueneza magonjwa kwa urahisi. Ni vizuri basi uhakikishe kwamba sakafu inafagiliwa na kuoshwa kila mara.

iv) Ukuta

Ni vizuri ukuta wa choo kurekebishwa mara tu unapoonyesha dalili za nyufa ambazo zikipuuzwa, baadaye husababisha ukuta kuporomoka. Ni jambo la aibu kutumia choo ambacho hakina siri ya kumficha mtu ndani.

v) Paa

Paa za nyasi au makuti huvuja iwapo nyasi hizo au makuti hayo yamezeeka. Ni vizuri kubadilisha kwa kupaua na nyasi au makuti mapya. Ukuta hubomoka kirahisi ikiwa utavujiwa na maji ya mvua yatakayodondoka kutoka kwenye paa linalovuja.

vi) Bomba la kutolea harufu mbaya na waya wa kunasia mainzi

Ni muhimu sana kulitizamatizama bomba la kutolea harufu mbaya kila mara. Hakikisha kwamba bomba ni safi na halina uchafu kama utando wa buibui. Hakikisha kwamba kile kichungi cha kunasia mainzi hakikuharibika ikiwa kimezeeka na kinaruhusu mainzi kupita, ni heri ukiondoe na ubandike kipya.

G	GHARAMA ZA UJENZI

Ili kupunguza gharama za ujenzi, ni muhimu sana kutumia bidhaa zinazopatikana humo humo mitaani, kwa urahisi.

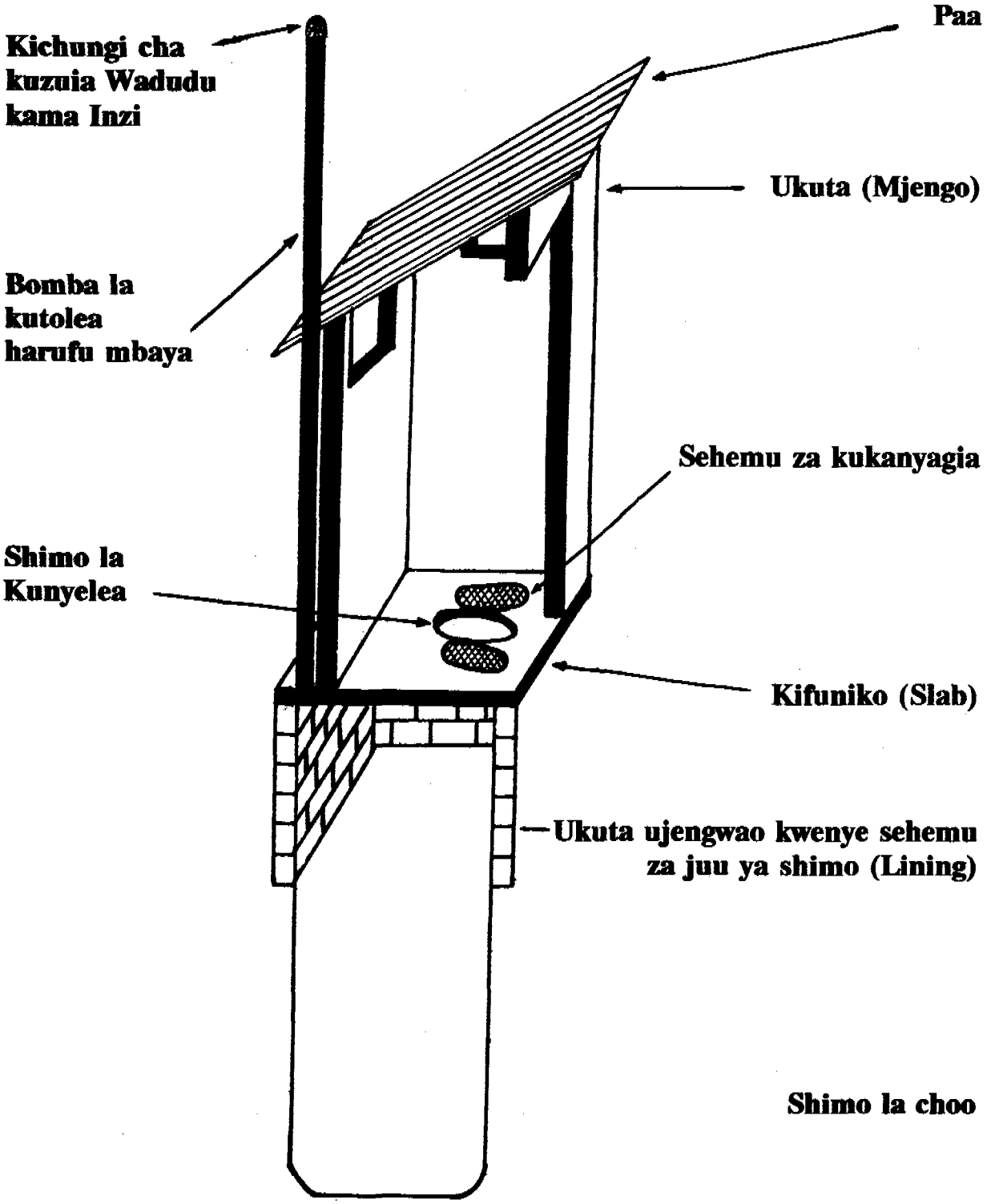
Katika sehemu moja ambayo choo hiki imara chenye hewa safi kimejengwa, imekisiwa kwamba gharama zote za ujenzi, kulingana na bei za bidhaa za mwaka huu wa 1992, ni kama ifuatavyo;

	MAELEZO YA KIFAA	Kshs
1	Kuchimba shimo kama mita 6	180.00
2	Ukuta kafika sehemu za juu	285.00
3	Kifuniko (Slab)	330.00
4	Bomba la hewa chafu	180.00
5	Kichungi cha kunasia inzi	5.50
6	Matofali ya udongo	160.00
7	Mlango wa makuti	45.00
8	Ufundi	300.00
	JUMLA	1485.50

Jumla ni Kshs 1,485.50

Ukiwa na swali au maoni,
wasiliana na KIWASAP

SEHEMU ZA CHOO IMARA CHENYE HEWA SAFI



GLOSSARY

Accessibility	Easily approached or entered
Aerobic	Living or taking place in the presence of air or oxygen.
Anaerobic	Living or taking place without air or oxygen.
Anopheline	Belonging to the anophelini subfamily of mosquitoes, which include the genus Anopheles.
Bacillus	A rod-shaped bacterium
Bacterium	Any of numerous unicellular microorganisms of the class Schizomycetes, occurring in a wide variety of forms, existing either as free-living organisms or as parasites, and having a wide range of biochemical, often pathogenic, properties.
Carrier	An infected person (or animal) that harbours a specific pathogen in the absence of discernible clinical disease and served as a potential source of infection for man.
Cercaria	The larval stage of a tramatode worm which emerges from the snail host. Often refers to the final stage of schistosome species, which leaves an aquatic snail and infects man through the skin.
Cestodes	Tapeworms of the class Cestoda. Many cestodes have an adult stage in the intestine of one host (e.g. man) and an encysted stage in the flesh of another (e.g. cow); e.g. Taenia saginatta
Chemotherapy	Medical treatment by chemical means.
Coliforms	A group of bacteria. Some of them, faecal coliforms, are normally found in human and animal faeces. They are Gram-negative, aerobic and facultatively anaerobic, non-spore-forming rods which grow in the presence of bile salts and ferment lactose producing acid and gas.
Community	A collection of different species living in a particular environment.
Compost	The humus-like product of the aerobic or anaerobic composting of either nightsoil or sludge mixed with organic material rich in carbon (such as refuse or sawdust).
Composting Toilet	A toilet into which excreta and carbon-rich material are added (vegetable wastes, straw, grass, sawdust, ash), and special conditions maintained to produce an inoffensive compost.

Convenience	Anything that increases comfort or makes work less difficult; a convenient appliance, service, condition, or circumstance.
Definitive Host	The host in which the parasite develops to sexual maturity.
Digestion	The breaking down of organic waste by bacteria.
Distribution	The pattern of distribution of parasites amongst the host population. Most parasites are not randomly or evenly distributed within the host population. Overdispersion - a minority of hosts harbour a majority of parasites.
Ecology	The study of the relationships between communities of organisms and their environment.
Endemic	Describes a disease or pathogen constantly present within a given geographic area or community.
Epidemic	The occurrence in a community or region of cases of an illness (or an outbreak) clearly in excess of normal expectancy.
Epidemiology	"The study of factors which affect the transmission and distribution of any disease." Epidemiology is a quantative science which relies on statistical methods for the measurement of disease parameters, but it is also linked to the broader area of 'Ecology'. The study of the geographic, frequency, environmental and behavioural causes, and transmission of disease.
Excreta	Refers to faeces and urine
Flagellate	A minute, single-celled animal (protozoon) able to swim with one or more whip-like structures (flagella); e.g. Giardia.
Fluke	A parasitic flatworm of the phylum Platyhelminthes, class Trematoda, usually having a snail intermediate host, e.g. Shistosomiasis
Habitat	A place or environment in which an organism naturally prospers and breeds.
Heemorrhagic	Causing haemorrhage or bleeding.
Helminth	A worm; especially, a parasitic intestinal nematode or trematode worm.
Host	An organism in which or on which the parasite lives. Many parasites have more than one host Eg. Wuchereria bancroftii which causes Filariasis.

Host Specificity	Some parasites are very 'host specific', they will only develop in one or two species of host, foe example the pork tapeworm Taenia solium which will apparently only mature in humans. Other parasites have a low host specificity, for example Trichinella spiralis seems to be able to mature in almost any worm blooded animal.
Hygiene	The science of health and the prevention of disease.
Immunity	A capacity to resist infection by a particular pathogen, acquired by previous infection or vaccination.
Incidence	The number of cases of a specified disease diagnosed or reported during a defined period of time, divided by the number of persons in the population in which they occurred.
Incidence rate	The proportion of a defined group or population which develop the disease within a stated period of time. Incidence measures the rate of occurrence of new cases.
Infection	An infectious disease (an infection) is one which is caused by a pathogenic organism, and can therefore be passed from one person to another. A person may be infected with a pathogen without suffering the symptoms of the disease.
Infective dose	The number of pathogens which must simultaneously enter the body, on average, to cause infection.
Ingest	To take into the body by swallowing.
Intensity of Infection	The actual number of parasites harboured by an individual host.
Intermediate Host	The host in which some development takes place but in which it does not reach sexual maturity.
Intestinal Tract	The part of the alimentary canal or digestive tube beyond the stomach.
Larva	A stage in the development of some organisms, including helminths and insects, differing from the embryo in that it can secure its own nourishment.
Mean Intensity of Infection	The mean number of parasites per host within a given population. This measurement must include all the infected hosts within the population.
Medium	A substance in which bacteria can multiply. Laboratories use special media in which only selected species thrive.
Metabolic	Related to the processes of chemical change which take place in living organisms, such as digestion and respiration.

mg/l	Milligrammes per litre; i mg/l is roughly equivalent to 1 part per million.
Micro-Organism	A microscopically small organism.
Miracidai	The embryos of trematodes. Often refers to schistosome embryos which invade the bodies of snails.
Molluscicide	A chemical which kills molluscs such as snails.
Morbidity	Sickness levels in a population, usually as a proportion or a rate. Frequency of a disease.
Mortality	Death caused by the disease, usually as a proportion or rate. Frequency of death.
Nematodes	Roundworms and other similar worms of the class Nematoda; e.g. Ascaris
Oral	Of the mouth.
Organic	Derived from living material or, in the case of chemicals, containing carbon.
Ovum	An egg.
Parasite	An organism which lives in or on its host, and in this process harms its host or in some way lives at the hosts expense. It mat harm its host by causing mechanical injury, such as boring a hole in it, eating or digesting it, absorbing its tissues, poisoning it with toxic products or by simply robbing the host of nutrition. Most parasites inflict a combination of factors.
Participate	To take part; join or share with others
Pathogenic	Capable of causing disease
Percolation	The soaking of liquids through the soil.
Phenols	Toxic organic chemicals formed by the breakdown of various soil-based chemicals such as petrol and bitumen.
pH	A measure of acidity or alkalinity, which can take values between 0 (extremely acid) and 14 (extremely alkaline).
Prevalence	The number of persons sick or portraying a certain condition at a particular time (regardless of when that illness or condition began) divided by the number of persons in the population in which they occurred.
Prevalence Rate	The proportion of the population infected with the parasite at a particular point in time.

Protozoon Any of the single-celled, usually microscopic organisms of the phylum or subkingdom Protozoa, which includes the most primitive forms of animal life. The smallest and simplest creatures that can be called animals. Each has only one cell and is between 0.002 and 0.5 mm in size; e.g. Entamoeba histolytica. The non-feeding stage in an insect's development between larva and adult.

Refuse Rubbish or garbage

Reservoir The reservoir is the host that maintain the parasite population in nature and provides a source of infection for human beings Eg. the house mouse is the reservoir for the dwarf tapeworm, Hymenolepis nana, adult tape worms live in the mouse - but can also live in the human intestine. Any human beings, animals, arthropods, plants, soil, or inanimate matter in which a pathogen normally lives and multiplies, and on which it depends primarily for survival. For instance, man is the only reservoir of typhoid bacteria.

Rickettsia Any of various microorganisms of the genus Rickettsia, carried as parasites by many ticks, fleas, and lice. Transmitted to man, they cause diseases such as typhus and scrub typhus. Simple single-celled organisms, smaller than bacteria but larger than viruses. They are parasites and grow in the living tissue of an appropriate host; e.g. Rickettsia prowazeki, the cause of louse-borne typhus.

Sanitation The formulation and application of measures designed to protect public health.

Soakaway An arrangement to promote seepage of effluent into the ground.

Species The control of disease vectors by methods directed at the sanitation behaviour of particular species.

Spirochaete Any of various slender, non-flagellated, twisted microorganisms of the order Spirochaetales, many of which are pathogenic, causing syphilis, relapsing fever, yaws, and other diseases.

Taxonomy The science of classification.

Toxic Poisonous

Transpiration Evaporation of moisture from the leaves of a plant; the moisture came from the soil, diffused into the roots, and moved up the stem to the leaves.

Trematodes Flat worms of the class Trematoda, including the parasitic worm called flukes. Trematodes of medical importance have intermediate stages in snails; e.g. Schistosoma.

Vector	The means of transmission from one host to another. Vector may be water, carrying protozoan cysts, or mosquitoes transporting malaria or filariasis, it is a very wide term.
Virus	Any of various submicroscopic pathogens consisting essentially of a core of a single nuclei acid surrounded by a protein coat, having the ability to replicate only inside a living cell. An exceedingly small parasitic organism. Viruses can only reproduce inside the animal or plant cells of a suitable host, but some of them can survive for long periods elsewhere; e.g. hepatitus A virus.
Worm Load	The number of parasitic worms (helminths) with which a person is infected.
Zoonosis	An infection or an infectious disease transmissible under natural conditions from vertebrate animals to man.