



**Federal Democratic Republic of Ethiopia  
Ministry of Health**

**Construction Usage and Maintenance of  
Sanitary Latrine Extension Package**

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## 1. INTRODUCTION

Human excreta (Faeces) are the source of many infectious disease agents. Diseases for which human excreta are the source are known as excreta borne diseases or Faecal Oral Route Infections.

Excreta - borne diseases are the most important and wide spread in Ethiopia the major reason for this is that majority of the population, specially in rural areas do not have access to safe and decent latrine system. Thus most of the population in rural areas and many villages defaecate in open fields or in any available spaces without any regard to the health risk that result from open field defaecation practice.

According to the 1994 (2001/2002) Health and Health related indicators (MOH) report, latrine coverage in the country was 49.7 percent Urban, 3.9 percent rural and 11.5 percent for whole population.

As result of the open field defecation practices, human excreta contaminate the surface soil/field, food and water sources. The exposed excreta provides breeding places for flies and other insects.

Flies carry from faeces infectious agents to food and finally reach the consumer with the food. During rainy season specially, the disease causing agent are washed or carried by flood to water sources: into rivers, streams, lakes, unprotected wells and springs which are the major source of drinking water in rural areas.

Consequently excreta borne diseases such as Typhoid fever, shigellosis, Amoebiasis, Helminthic infections are very common and serious in the country. these disease can easily be controlled if every body uses a properly constructed and maintained Latrine system!!

Therefore the purpose of this package programme is to:-

Help the individuals and families of the community to realize and be convinced about the danger of open field defecation practice;

- ◆ Enable them to build a safe latrine system, and develop the habit of continuous use and maintaining a latrine system, thereby control and prevent Excreta borne diseases in the community on their own accord.

## **2. General Objective**

To help the community to build and use a sanitary latrine system, and thereby reduce or eliminate excreta borne disease and create healthy and productive people.

## **3. Specific Objectives**

- 3.1. To increase community's awareness and understanding about building and using latrine system.
- 3.2. To enable each family to build, maintain and use a latrine always.
- 3.3. To enable the community member to develop the habit of washing hands after visiting latrine.
- 3.4. To enable the community to build latrines which are acceptable, affordable and replicable.
- 3.5. To prevent field (soil) water, food, animals and plants against pollution by excreta.

## **4. Implementation Strategies**

- 4.1. Introducing the community about the general purpose of the package programme.
- 4.2. Carrying out preliminary survey.
- 4.3. Drawing up Action Plan which involves community participation.
- 4.4. Carrying out training activity.

- 4.5. Establishing co-ordination mechanism with the community members, Governmental and Non-Governmental agencies who could be potential supporters of the package.
- 4.6. Involving health institutions and health workers.
- 4.7. Motivating, educating and organizing the community to bring about behavioral change.
- 4.8. Using local resources.
- 4.9. Using demonstration method.
- 4.10. Exchanging of experience.
- 4.11. Applying motivational method.
- 4.12. Applying local rules and regulations.
- 4.13. Carrying out monitoring and evaluation activity.

## **5. Activities to be carried out regarding the usage and maintenance of safe latrine.**

- 5.1. **Introducing to the community about the general package programme of using and maintaining safe latrine**
  - ◆ to administrative officials.
  - ◆ To house holds who constructed but not using properly latrine
  - ◆ to the health institution and health workers of the area.
  - ◆ to well-known and influential members of the community.
  - ◆ to local Governmental and Non-Governmental agencies etc.
  
- 5.2. **Carrying out Preliminary Surveying.**
  - ◆ House holds using latrines.
  - ◆ House holds not using latrines.
  - ◆ Households who have space for building latrines.
  - ◆ Identifying building materials for latrine construction.
  - ◆ finding out reasons for not building latrine.
  - ◆ Knowing about the community's knowledge attitude and practice regarding latrine usage etc.

**5.3. Drawing up Action Plan which Involves Community Participation.**

- ◆ Preparing action plan based on the preliminary survey with full participation of the community.
- ◆ Preparing a work schedule on weekly, monthly or yearly basis as appropriate.

**5.4. Carrying out Training Activities**

Training of community members, community health agents, well known and influential people, who could be potential supporters of the package.

**5.5. Establishing co-ordination mechanism with Governmental and Non-Governmental agencies and civic organizations, who could be potential supporters of the package programme.**

- ◆ Administration:- to get administrative support.
- ◆ Agriculture:- to gain the support of the development workers.
- ◆ Education:- to teach teachers and students so that they will be able to teach the community members and students.
- ◆ Establish co-ordination mechanism with youth and women's associations.
- ◆ Religious, government and non-governmental organizations.

**5.6. Involving health institutions and workers of the area.**

- ◆ To obtain direct technical assistance during the implementation of the package programme.

**5.7. Motivating, educating and organizing the community to increase participation and to bring about behavioral changes.**

- ◆ At household level, give in depth and continuous training about the need for and skill for latrine building.
- ◆ Give lectures at meetings, such as Edir, religious gatherings and at public holidays about the need for and building skills of latrine construction.

### **5.7.1. Trainings to be given**

Disease-causing agents transmitted through human excreta are viruses, bacteria, protozoa, intestinal parasites and the like. These disease agents affect more the people who are at lower living standard and cause economic and social damages.

In order to enable the community to prevent the above described diseases, the community have to bring about behaviour change. In order to effect this change, environmental health and health education are the important determinants.

Therefore, the main concept shown in the table below be given as training to the community to enable them to grasp the idea, and based on this build and use safe latrines.

**5.7.1.1. Diseases Transmitted Through Human Excreta: Their Mode of Transmission and Control measures**

<b>S.N</b>	<b>Disease causing agent</b>	<b>Type of disease</b>	<b>Preventive Measures</b>
1	Virus	<ul style="list-style-type: none"> <li>• Hepatitis (A) popularly called bird's disease</li> <li>• Polio etc</li> </ul>	<ul style="list-style-type: none"> <li>• Building and using properly latrine</li> <li>• Washing hands with soap after visiting latrine</li> <li>• keeping water safe</li> <li>• Eating safe food</li> <li>• Not to use fresh faeces as fertilizer</li> <li>• washing properly vegetables eaten raw</li> <li>• Eat properly cooked meat</li> <li>• Avoid Walking bare foot (wear shoes if possible)</li> <li>• Do not wash in polluted water and do not bathe in polluted water</li> </ul>
2	Bacteria	<ul style="list-style-type: none"> <li>• Shigellosis</li> <li>• Typhoid</li> </ul>	
3	Protozoa	<ul style="list-style-type: none"> <li>• Entameba histolytica</li> <li>• Giardia etc.</li> </ul>	
4	Intestinal parasites	<ul style="list-style-type: none"> <li>• Ascariasis</li> <li>• Hook worm</li> <li>• Tape worm</li> <li>• Bilharzia</li> </ul>	

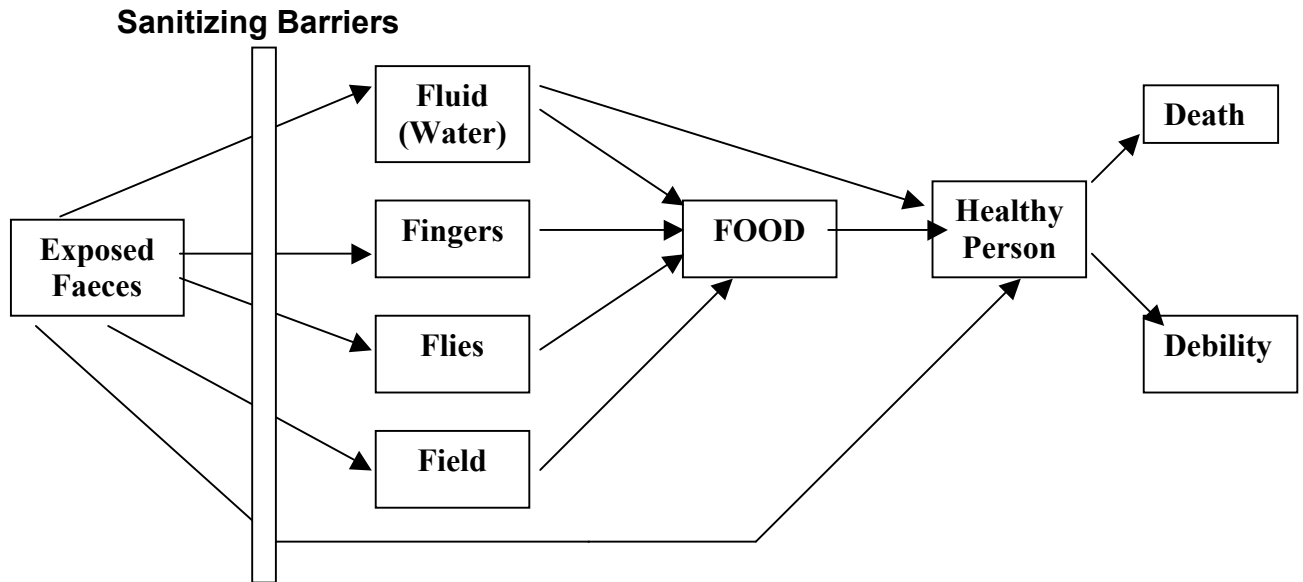
**5.7.1.2. Pollution of environment by human excreta, and methods of excreta-borne diseases transmission.**

Not using properly constructed latrine causes transmission of excreta borne diseases by the agents excreted with excreta. This results from open field defaecation which helps the spread of excreta borne discuses to be communicated from man to man and to domestic animals.

The method of transmission is shown in the figure below



**Figure 1 :-** Mode of Transmission of excreta Borne Diseases.



**This Diagram, known as Five "F" Shows Transmission routes (Five "F") of excreta Borne Diseases.**

### **Explanation of the Five "F" Diagram**

This diagram, often called Five "F" diagram, clearly shows the different transmission routes whereby Pathogens from exposed Faeces of an infected person (through the Five "Fs") Infect healthy person.

We will see each of the above described chains of transmission one by one.

- **By eating food without washing hands after visiting latrine**

A person can touch faeces while defaecating, and can spread the disease organism, if he or she eats without washing hands (fingers), he/she contaminate the food contact items, eating plates cutlery, by shaking hands with people, hence diseases such cholera typhoid fever, intestinal pathogens.

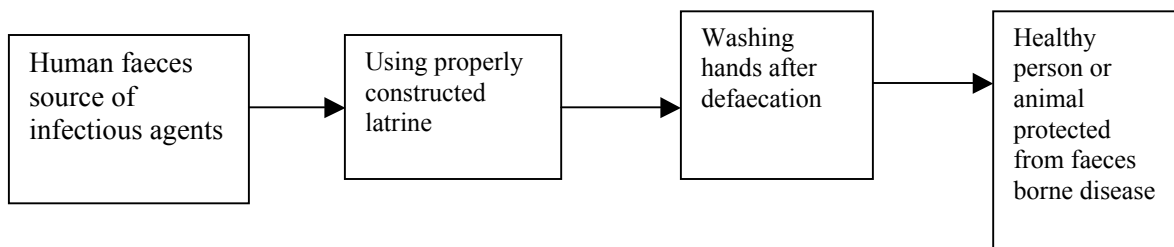
- By drinking faeces contaminated water either for drinking or food preparation. When a person infected by different excreta-borne diseases agents defaecate in open field, he contaminates the water by these agents. Healthy person can acquire the disease by drinking contaminated river water, by washing in contaminated water and contacting contaminated water. The diseases contacted are such as diarrhea, typhoid fever, bilharzia etc.
- **Transmission by fly**  
Flies breed in human excreta, animal dropping, and the like which are decomposing organic matter. When people defaecate in open field, flies carry pathogens from the faeces to human food and transmit such disease Cholera, amebiasis etc. This happen when the fly rest on foodstuff which is not covered, man eats this food and gets the diseases.
- **By walking bare foot on pathogens infested soil**  
When a person infected by hookworm defaecates on the field, he or she infests the field with infective stage of hookworm. When a healthy person walks bare foot on this infected soil, he encounters the hookworm disease. The infective stage of the hookworm enters into the body by penetrating the bare skin of the leg. In general not using latrine, and defaecating any where in open field expose the people to such diseases as amebiasis, typhoid fever, shigellosis, cholera, hook worm, bilharzias, ascariasis, tapeworm etc. are spread from man to man and from animals to man.

#### 5.7.1.3. **Advantage of latrine facility**

using properly constructed latrine and burying excreta in proper pit has the following advantages:-

- Helps to avoid direct contact with faeces
- Avoids pollution of soil, water, air, animals and vegetables by human excreta
- Helps to prevent contact of flies, rodents, and other insects etc with faeces.
- Avoids foul odour from the environment, hence helps to maintain beautiful surroundings.

We can see clearly the advantages of using properly constructed latrine from the following chain of excreta /faeces-borne diseases transmission.



## 5.8. Building latrine using local resource

### 5.8.1. Site selection for latrine

- Must be sited at least 30 meters from any water source meant for human consumption and at lower gradient from water source.
- In order to avoid health risk and create convenience, the site should be at least 6 meters from living house and on the lee ward side.
- The depth of the latrine should be reckoned in such a way not to contaminate ground water.
- The latrine should be built in a site where air circulation is not obstructed.

- If not possible to bail out when full, site should be prepared to build new one.
- Latrine facility meant for public and institutions should be located in easily visible place.
- Ensure that there is a path or road to bail out when full.
- Latrine location should not be water logged and exposed to flooding

### **5.8.2. How to build a latrine**

Building traditional pit latrine

when building a traditional pit latrine, the following points should be fulfilled:-

The picture shows various parts of a typical sanitary pit latrine.

#### **5.8.2.1. The pit**

The pit is one part of the latrine which holds faeces and urine.

#### **Steps for construction**

1. The pit is dug at a depth of 2.5 to 3 meters depending on the water table level of the area.
2. If the ground water level is high, and if the area is stony, the latrine can be built raised above ground level to obtain the necessary depth.
3. In order to reduce the chance of collapse, better to make the pit circular.
4. The circumference of the pit be from 90 cm. to 100 cm.
5. When digging the pit, it should be broader from top and gradually decreasing at the bottom part of the pit.
6. If the soil is firm and strong it is possible without building protection wall.
7. If the soil is easily colapsable, then build with stone and cement the sides of the pit until firm soil is reached.

#### **8.5.2.2. The floor work**

The floor is part of the latrine built in such a way that humans and animals will not fall into the pit. It can be built with locally available material.

#### **Steps for building the floor**

1. Prepare items needed such as log if wood, flat stone etc.
2. The length of the support should extend 40 cm from the side wall of the pit on both sides.
3. the support should be laid close to each other (the logg) and prevent termite by using burnt oil or ash.
4. The support logs should be nailed together to prevent shaking. If no nail, tie with string. If the support is flat stone, should be placed straight and close to each other.
5. The drop hole for faeces must be made 18x30 cm between two support logs.

6. To avoid faeces being scattered on the support logs, the hole must be made straight for dropping faeces.
7. Plaster floor with mud, straw or teff residue
8. If the floor is to be built with concrete, it should be raised 20 cm. from ground level

- **Building the faeces drop hole and foot rest**

The dimension of the faeces drop hole as stated above, it is possible to build space for easy movement of the user by having 5 cm. high and 30 cm long wooden material or flat stone within the floor area.

#### **8.5.2.3. Building super structure**

The super structure can be built with locally available material wood bamboo, poles, mud brick, cement block, clay, brick, stone, corrugated iron sheet etc. The purpose of the superstructure is for the convenience of the user. At any time the user can use easily.

#### **How to Build**

1. Plant lead pole 30 cm. deep at the sides of the pit.
2. The lead poles must extend from ground level 2 meters in the front and 1.80 meters at the back.
3. In order to protect from termite, the end of the lead pole which goes in to the ground be smeared with burnt oil or tied up with plastic cover.
4. After planting the lead poles compact the lead poles.
5. Plant other poles around the lead poles.
6. Leave 60 cm space for the door and tie up the other poles with the lead poles.

7. After this, depending on the household income, the wall can be plastered with mud or covered properly with corrugated iron sheet, wood and mud or thatch grass.
8. When constructing the latrine by concrete block stone or bricks, consult artisans in the locality who have the technical know how.

- **Raising the level of the latrine**

In order to prevent intrusion of flood, rodents, chicken etc into the latrine, the surrounding of the latrine should be built raised 20-40 cm above ground level.

- **The Roof**

The roof is another part of the latrine. It prevents the user from being exposed to rain, heat from the sun during use of the latrine. It can be constructed from locally available material e.g. plastic, straw, corrugated iron sheet etc.

- **How to Build the Roof**

- The front and vertical lead poles and the horizontal poles must be nailed together or tied up with string.
- In general a pit which has dimension of one meter by one meter needs 3 to 4 horizontal poles.
- It should be made 40 cm. distance from the front wall and 30 cm. from the behind wall and must extend to outside of the wall.
- At every 60 cm distance the vertical poles must be nailed or tied up.
- The horizontals must extend on the two sides of the wall 30 cm. towards outside.
- The horizontals and vertical lead poles can be made nailed together or tied up with string as desired by the users.

- The roof made as described above, can be covered with straw or thatch, thick plastic material or corrugated iron sheet.
- **The Door**  
The door serves for entry and exit to the latrine and helps the user not to be seen while relieving himself. Hence every latrine should have a door.
  - The door can be made from bamboo, sticks or leaves of tree, corrugated iron sheet etc.
  - The door should have width of 60 cm and height of 1.70 meters.
  - For ease of user and for strength, the door should be hinged or tied up with string with the lead poles of the wall.
  - For the convenience of the user, it should have pad lock inside of the door.
- **Drainage for Flood**  
At distance of one meter around the walls of latrine drainage should be made to prevent flood entry and to elongate the life of the latrine.
- **Cover for the Faeces Drop Hole**  
In order to prevent the latrine being breeding place for insects, for flies. There is need to have cover for the latrine hole. The drop hole should be covered completely and the cover should have a handle 60 to 75 cm height.

The covers can be made of prepared lumber, corrugated iron sheet or bamboo network.

#### 8.5.2.4. **Wash Hand Basin**

A person who have touched faeces, can spread disease agents for others or to himself. Therefore, it is necessary to wash after



using the latrine or defaecation. Therefore, near the latrine, in an appropriate place there must be a wash-hand basin. The wash-hand basin can be built near the latrine by using clay bricks, gourd, tin can from paint container Jerrican etc.

### **8.5.3. Ventilated Improved pit latrine (VIP)**

As the name implies VIPL, is a modified latrine different from the traditional pit latrine in that it removes the foul smell which usually comes from latrines, by means of a vent pipe.

- The VIPL is usually constructed from cement concrete (the walls) and floor. It is useful for places where there are many clients, such as places of working, schools, and other places where people congregate. The dimensions and space area can depend on the number of users.
- VIPL can be constructed also for households from locally available material such as bamboo, making it appropriate for exit of smelling gas from the pit (vent pipe).
- When constructing VIPL for public, one seat should be allocated to serve not more than 50 clients.
- The steps for constructing a VIPL is generally similar to that of the traditional pit latrine except the addition of some items.

Additional items needed for constructing VIPL:-

1. Material needed for removing foul smell  
Prepare for vent bamboo, P.V.C (Plastic Tube) cement tube, corrugated iron pipe etc.
2. The vent tube has to be painted black colour
3. The hole for inserting the vent tube be behind the latrine pit.
4. The vent tube must extend above the roof of the latrine 30 cm.

The Picture below shows a single VIPL with superstructure made of mud and pole.

#### **8.5.4. Temporary Latrine**

Temporary latrine is a latrine system which serves people when they are on move for such thing as moving to new settlement place, moving away from the normal abode during war or natural disasters. It is supposed to serve only for few days or weeks.

##### **How to Arrange Temporary Latrine**

- Dig pit 50 cm. wide one meter depth and the length can be as long as the number of users.
- When digging as above i.e. the width and depth, the length should be 10 meters for every 500 clients or users.
- Pile up earth which comes from the pit on one side of the trench for covering faeces after defaecation.
- Spade, or flat piece of stone or any convenient Item can be used for scooping the earth to cover the faeces.
- After defaecation each person must cover up the faeces with earth piled up nearby.

- Ensure that the faeces is completely covered with earth. This will prevent access of fly to faeces.
- When the temporary pit (trench) is full up to 20 cm. level cover it up properly and prepare another similar trench.

### **5.8.5. Usage and maintenance of latrine**

#### **5.8.5.1. Maintaining cleanliness of latrine**

After building a latrine, there is a need for supervision and follow up the proper usage and maintenance of cleanliness.

If this is not done, then the latrine did not accomplish the purpose for which it is constructed, and health risk remains as it is. Therefore, the latrine should be constructed with provision of water for washing the floor of the latrine, the wash water should flow into the pit hole and be maintained clean always. Similarly other parts of the latrine, the walls and roof be maintained in repaired condition.

#### **5.8.5.2. Usage of Latrine**

- Even if latrine is built, unless it is properly used it is not possible to cut the chain of disease transmission from faeces. Therefore, the following points should be implemented.
- The slab should be placed properly to lead the faeces and urine directly into the pit
- Washing hands with soap and water after defaecation
- Teach the children not to defacate around the latrine and play with faeces.
- Ensure that the latrine is cleaned regularly.
- Except faeces and urine no solid house waste be dumped into the latrine pit.

- Cleansing material after defaecation, solid items, should not be thrown into the latrine but be buried separately to prolong the life span of the latrine.
- For public latrines, assign persons (for male and female) for keeping cleanliness of the latrine

### **Hand-Wash Basin**

Providing a properly constructed wash hand basin, for washing hands after using the latrine keeps to build a healthy community.

**The Picture shows a proper wash-hand Basin for hand washing after using latrine.**

## **8.9 Using OF DEMONSTRATION METHOD**

- ◆ Construct model sanitary latrine in a suitable place, and show the community members so that they can be build and use their own latrine.
- ◆ Households can build common latrine for families who would like to do the same.

### **5.10 EXCHANGING OF EXPERIENCE**

- At Kebele. The kebeles which have achieved a successful work can be example for other kebeles which did not do a good work.
- Extension workers from other areas can gain experience by visiting the successful work of the extension worker.

### **5.11 APPLYING MOTIVATIONAL METHOD**

- Give incentives to the kebele which has successfully implemented the package program.
- Give certificate of merit.
- Giving locally available inexpensive materials.
- Citing as exemplary in meetings.

### **5.12 APPLYING LOCAL RULES AND REGULATIONS**

- Applying local rules and regulations by synchronizing with the government rules and regulations.
- Enabling the community to prepare plan of action, which is acceptable to them.
- Applying government policies and regulations

### **5.13 CARRYING OUT MONITORING AND EVALUATION ACTIVITY**

- Following the implementation of the action plan.
- Informing the community about the implemented plan of action.

## **6. EXPECTED OUTCOME**

Expected outcome on need, construction usage and maintenance of sanitary latrine

1. The package program implementers will have adequate information and knowledge.
2. Community participation will be developed on usage and maintenance of latrine from planning stage to completion.

3. More package program supporter will be created because of the training given.
4. Coordinated working pattern will be developed.
5. Community's knowledge and skill will be increased on construction, usage and maintenance of latrine.
6. The community will control excreta borne diseases by building and using properly the latrine system.
7. Through exchange of people to people experience, they will build and use their own latrine.
8. Water and land pollution and exposure to animals of human excreta will be avoided.
9. People will develop the habit of washing their hands after visiting latrines.

## **7. SHORT METHODS OF COMMUNICATION**

### **7.1 Places for communicating messages**

- House to house visit at household level
- At village level
- At schools
- At health institutions
- At religious places (church, mosques)
- At traditional gathering places, Edir, etc
- At markets
- At development offices
- At public gatherings

### **7.2 Methods of communicating messages**

- Person to person (discussion)
- Calling meetings
- Group meetings
- Using demonstration method
- Using drama, songs, poem, story telling

- Exhibition
- Preparing special short presentations at public holidays.
- Use of tape recorder
- Using posters, pamphlets, brochures
- Using newspaper, radio, television and the like mass media, if available in the area
- using health education films

### **7.3 Messages to be communicated**

Will be accomplished based on the package program action plan.

## **8. Problems which may be encountered in implementation of the package program**

### **8.1. Problems which may be encountered.**

- Influence of culture and tradition  
e.g. the tradition of open field defecation
- Fear of using the latrine
- Dislike of odour created by badly constructed latrine
- Shortage or lack of building materials in the locality
- Lack of support from local administration and social organizations
- The worker may not spend adequate time due to other pressing work

### **8.2. SOLUTIONS**

- Motivating and giving continuous education in order to overcome harmful traditions
- Using alternative materials and methods
- Changing the attitude of the potential supporters of the package program by giving continuous education and motivation
- Increasing motivation and willness of the worker by:

- ◆ giving short training, seminars and workshop attendance opportunity
- ◆ experience exchanging
- ◆ giving moral support
- ◆ giving promotion and the like
- ◆ enabling the worker to spend full time on the package program

## 9. MONITORING AND EVALUATION

### 9.1. Monitoring

- Monitor whether households, workplaces and institutions have constructed latrines and using them properly
- Are the latrines constructed properly e.g the floor, walls, roofs, doors etc?
- The cleanliness of the latrine: no faeces and urine around except in the pit
- Presence of children's faeces in the compound
- Distance of the latrine from kitchen, eating place, water source etc
- Presence of flies in and around the latrine
- Whether the latrine is full, if so not more than 50 cm level
- Presence of hand washing facility
- Whether the people have built and replaced a better latrine from the old one and are using it
- Number of people given education about proper latrine construction and use  
Male \_\_\_\_\_ Female \_\_\_\_\_ Total \_\_\_\_\_
- Number of meetings held regarding safe latrine construction, use and maintenance
- Number and type of audio visual materials used
- Type of cleansing materials used, if any

### 9.2. EVALUATION

- The package program in general and its plan of actions



- Actions prepared to implement the package program
- Resources used for the implementation of the program
  - Human resource: number and profession
  - Material: local and external support
  - Finance: from the community and donation
- Implementation strategies
  - Field trips
  - Collecting reports and analyzing them
  - Discussing with beneficiaries
- Activities achieved
  - Coverage in percent, number or ratio
  - Strong points achieved
  - Weak points identified
  - Impact on the community by achieved activities
  - Suggestions given on encountered problems

## **REFERENCES**

On Sanitary latring construction use and maintenance.

- Gabre Emanuel Teka  
Human Excreta Disposal-Ethiopia:  
A practical approach to environmental health united printers,  
1984 (contact the author) Addis Ababa
  
- Peter Morgan: rural water supplies and sanitation Macmillan company,  
1990,NY
  
- Uno Winblad: sanitation with out water revised and enlarged Macmillan  
Co, NY 1985.
  
- Human and other liquid waste management for environmental health  
students lecture notes  
Kebede farisetal Jimma University  
Jimma, 2001