Teachers' Training in Environmental Sanitation and Community Health under ODA-British Council Andhra Pradesh Primary Education Project

Unit 2

LOW COST SANITATION TECHNOLOGY

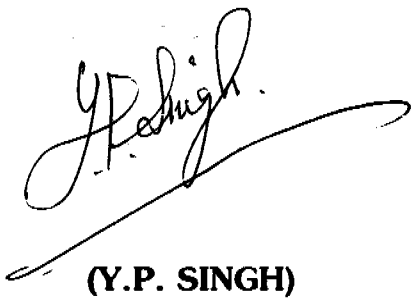
Salabh International Institute of Rural Development, Research and Training, New Delhi

PREFACE

There is absolutely no doubt that our children of today will become the responsible citizens of tomorrow. Every child is a keen student as most of his/her learning is through the myriad of images which he or she observes in the world around him/her- whether it is the school or home. These immediate environs act like an open book for the child to understand and absorb a new lesson every day.

Thus, it is important to inculcate the sensitivity towards sanitation and hygiene in the young right from their tender years. And, schools are the best modes to ingrain the basic facts of sanitary facilities and their appropriate usage in their impressionable minds. This student-training is vital since they are our ambassadors of tomorrow who would spread the message of creating a pollution-free world by keeping the surroundings clean and hygienic through low-cost sanitation measures.

These students are our positive catalysts who will start the auto-catalysis and accelerate our environment campaign both at home as well at the school. Hence, the dire need of imparting the knowledge pertaining to the the fundamentals of low-cost sanitation in not only urban but also rural India.



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Chapter 1

MANAGING WASTE WATER: RECOMMENDED PRACTICES

May it be a village, a shanty town or the outskirts of a big city, most such places lack sewage drains and proper sanitation system. The water coming out of the village houses and wells collects in a muddy pool nearby and is a popular breeding spot for mosquitoes and other fellow insects. Such waste-water stagnation around a community water source is a common sight. This is caused primarily by the spill-over during water collection. Over a span of a few days, the run-off accumulates and poses serious environmental problems. This could well become the root cause of the spread of infection and disease in the community.

Generally, surface water around a 15 metre radius of a well percolates into it, and can pollute the underground water, making it unsafe for drinking.

A family on the average, collects eight to ten pitchers of water every day. Normally, while one pitcher is being filled, two litres of water gets spilled. So, at a water-source serving 50 families, around 800 to 2000 litres of water is spilled every day.

This spill water is not heavily contaminated. It contains only mud and the dirt on the feet of the water carriers. So, it can be easily and inexpensively cleaned and made available for users other than drinking and cooking.

A Spill Water Recycling Unit or a Soak Pit could effectively manage the waste-water problem. In fact, recycling of spill water purifies it to a great extent by reducing the bacterial count by 85.08 percent and the total solids by 48.97 percent.

The recycled spill-water can be used for various purposes, like:

- **feeding and care of livestock;**
- **washing of clothes;**
- **gardening;**
- **household operations like sprinkling the yard, cow-dung plastering, etc.**
- **construction of houses;**
- **pisciculture; and**
- **cottage industries requiring water, like brick-making.**

A spill-water recycling unit is basically a community project and hence the readiness of the community to maintain the unit through cleaning should be ascertained.

Spill-Water Recycling Technology

The construction of a spill-water recycling unit is also simple. The device consists largely of simple masonry structures, most of which can be prefabricated.

Fabrication of skeletal frames for the different chambers of the recycling unit is done by cutting the iron rods into pieces and welding them together according to the specifications.

- Wrap the four sides and the bottom of each of the three skeletal frames with weld mesh by welding the mesh to the iron rods.
- Apply cement plaster of 2.5cm thickness to the skeletal frame of the chamber in 1:3 proportion (1 part cement and 3 parts coarse sand), ensuring that the thickness of the plaster is distributed equally on either side of the metal reinforcement.
- Cure the prefabricated chamber for 7 days.
- Make a strainer of perforated G.I. sheet in the shape of a bucket with a handle that will fit into the inlet chamber.
- Make a cover of G.I./wood with a handle for the inlet chamber. Fabricate a concrete cover of 2 cm thickness for the filter chamber and the inspection chamber and 4 cm for the silt-disposal pit.

Installation of the Recycling unit:-

- Make an area 200 cm x 35cm beside the water source: the hand-pump or the well. Dig it to a depth of 45cm. Place the inlet chamber, the filter chamber and the inspection chamber in the pit in such a way that the spill-water from the water-source will fall into the inner chamber. Make sure that the tops of the three chambers are at level with the ground around.
- Dig a pit 1m x 1m to a depth of 2m at a convenient spot about 2m from the inlet chamber. Line the walls of the pit with honeycomb masonry structure and connect to the pit and the silt-release hole of the inlet chamber securely with a pipe of 50 m diameter fitted with a 50mm gate-valve. Pack the periphery of the silt -disposal pit with pebbles and small stones.
- Connect the outlet of the inlet chamber to the inlet of the filter chamber.
- Connect the outlet of the filter chamber to the inlet of the inspection chamber.
- Line the periphery of the inlet chamber, the inspection chamber and the gate-valve-housing with bricks for edge-protection.
- Dig a pit of 0.60m diameter and 1m depth at a convenient spot next to the inspection chamber. Line its walls and bottom with brick masonry structure. Connect the outlet of the inspection tank with underground PVC pipe of 50mm diameter.
- Fill the filter chamber with graded granite chips with the largest stones next to the inlet chamber, smaller ones next to them and the smallest ones next to the inspection chamber.
- Cover the different sections of the recycling unit.

Most of the solid impurities in spill-water, like straw, coir or leaves are trapped by the strainer of the inlet chamber. The strained water passes slowly throughout the filter chamber and, during its passage, a major portion of the solid impurities are held up between the granite chips by sedimentation. The water that comes out from the filter chamber is fairly clean and usable.

The bacterial count of the recycled water is reduced because of the affinity of the bacteria in the spill-water towards the impurities held up by the granite chips in the filter chamber. The filter medium acts both as a mechanical barrier and as a biological one.

The strainer in the inlet chamber has to be cleaned every day to remove the debris and the silt trapped in it. A thorough cleaning of the unit once a week is desirable.

Soak Pit

A soak-pit, on the other hand is the most effective solution for disposal of waste-water in areas where drainage is not feasible. The soil could be gravel, sandy loam soil, silt mixed with sand or any such where percolation is possible. The soak pit, if well constructed, can soak a large amount of water and keep the area around it clean and dry.

The soak-pit is a simple cheap pit to avoid germ-bank formation due to stagnant water deposition. It not only keeps the environment clean but also runs for 15 to 20 years without getting choked. On an average, the pit next to a house can soak up to 100 buckets of water every day. The soak-pit operates very efficiently in all kinds of soil, except the rocky ones.

The major advantage of a soak-pit is its compact design which does not permit the solid impurities to pass through the trap. As a result, the life of the pit gets extended. The design permits construction of the soak pit at a distance from the drain outlet. Even in the middle of a street, a soak pit can be made. The weakening of the walls of the building by moisture-seepage from the soak pit could also be avoided by constructing the pit away at a distance from the building.

Periodically, the soak-pit trap requires cleaning with a wooden spatula. Up to two litres of water is poured to clear the trap and the passage. When the topsoil-cover around the soak pit is found to be constantly moist, the pit is to be fully cleared and refilled with clean stones as it is an indication of the soak pit becoming choked. Take care that the dirty water does not spill out anywhere but into the cleansing pitcher.

A soak pit or a waste water recycling unit can take care of spilled water in an efficient manner provided the system per se is constructed carefully and the precautions are observed strictly. Constructions of drains in general for the community and micro-drains inside the house, leading to kitchen gardens, are some other measures to check waste-water storage. Improper drainage and waste-disposal is one of the major causes for insanitary conditions in rural areas. It gives a foul smell; breeds flies and mosquitoes; pollutes the water source nearby; causes falls and slips; encourages rat infestation, infection and spread of disease in the community.

The Technology

Material Required

Big, medium and small stones; gravel or thick sand; mud; jute-cloth or jute-bag - an old mud pitcher - discarded tin-box; coconut fibres or dry grass; Jamun or Palm branches and an open 1.5 ft. long tin-pipe.

Soak-Pit for a House-hold

1. Dig a pit exactly below the exit of the household drainage (the dirty water from kitchen or bathroom). It should be one foot away from the wall.

The pit is 3 ft. long by 3 ft. broad and 2.5 ft. deep. It is 3 ft. deep at the far end to attain a gradual slope for the smooth flow of water.

2. Select three sizes of stones for filling the soak-pit : Large (papaya-sized), Medium (Guava-sized) and Small (lemon-sized). Fill the pit with large stones up-to a height of one foot, topped up by medium sized stones for the next foot, and lastly by small stones for the last one foot. Keep little space between stones rather than crowding them for quick filtration of drain-water.

3. The exact spot where the drain-water falls into the pit, is marked for placing a 'cleansing - pitcher', later. Clear up a one foot broad and one foot deep cavity in the stones for this pitcher. Place a big boulder in the void (to be replaced later by the 'cleansing - pitcher').

4. Now cover up the pit with Jamun or palm branches (Jamun, palm branches do not easily rot in water). These branches should be placed across each other.

   This simply means that the first layer should be facing East-West and the second North-South. Remember to leave the 'cleansing - pitcher' space uncovered.

5. Take old jute-strips or a jute-bag and cover the branches with this bag or cloth. Then, repeat the criss-crossing of branches on top of this jute-layer.

6. Wet the mud (dug out of the pit); fill this clay in a basin. And then, throw it with great force on the branches so that a thick clay layer completely covers the pit.

7. Form a 3" - 4" thick layer of gravel atop the mud layer. Now remove the big boulder and replace it with the cleansing-pitcher.

8. <u>The Cleansing-Pitcher :</u>

   Take an old mud - pitcher. The diameter of its mouth should be big enough to allow the passage of a 2 kg tin-can. Pierce five big holes in the bottom of the pitcher and a lot of others in the tin's bottom. Fill half the tin-can with coconut fibre, rope or dry grass. This is a must to check the passage of dirt, soap, oil and solid particles. Now, fix this can in the neck of the pitcher in such a way that only 3 inches of the can is inside the pitcher. This eases the process of removing the can for periodic clean-ups.

9. Place the cleaning pitcher just below the drainage pipe. Fix the pitcher properly by embedding most of it in the stone-bed and covering its sides with sand and gravel.

   Fix an open short (1.5 ft.), tin pipe at the exit of the drainage-hole in such a manner that the dirty water trickles down directly into the cleansing pitcher.

Note :

(I) Clean the can once in a fortnight and replace the old grass and coconut fibre with fresh ones.

(II) Wash the pitcher, alongwith the can, thoroughly once in two-three months, with water. Dry it and put the whole contraption back in the original place.

(III) Take care that the dirty water does not spill out anywhere but into the cleansing pitcher.

Chapter 2

ENVIRONMENTAL SANITATION : MEANING AND SCOPE

Environmental Sanitation is basically an adoption of cleanliness and hygiene measures to eliminate unhealthy elements from the environs. In fact, environmental sanitation encompasses a broad spectrum of health-related measures. It covers all the aspects of environmental and household cleanliness like the disposal of human excreta, cattle dung, garbage and waste water; use of smokeless chulha; cleanliness of the house; appropriate food hygiene; as well as personal hygiene.

United Nations has aimed the year 2000 as the goal year for achieving the target of universal access to safe drinking water and sanitation services and elimination of the water-borne guinea worm disease ***(dracunculiasis)***, but Asia and Latin America still lag behind in terms of environmental sanitation. More than 90 countries received UNICEF support for Water supply and environmental sanitation (WATSAN) projects in 1993, but they have still to go a long way. The Executive Director of WATSAN has recently admitted during a global workshop that, "We have come a long way in the last 50 years, but we will not able to meet the goals by the year 2000 unless we bring basic water supply and sanitation to every one".

Such is the importance of Environmental Sanitation that one can not dream of achieving the goal of Health of All by the year 2000 by avoiding this vital aspect. The major challenge for all countries today is to create more public demand for sanitation service, and to mobilize to bring about changes in community hygiene behaviours to reduce water and excreta-related diseases. With the world's urban population growing at a rate of about 160,000 people a day, new and innovative ways will have to be found to create community access to sanitary waste disposal and safe water supply. Much of the new urban growth is in slums and squatter settlements beyond the range of city services. Hence, the need for community action for observing environmental sanitation.

First of all, it is important for the community to be aware of the various components of Environmental Sanitation, e.g. the importance of using latrines; hazards of open-air defecation; disposal of rubbish; checking disease-carrying insects and vermins (flies, mosquitoes, rats, etc.); preventing water-contamination; checking food-contamination; using smokeless chulha; appropriate disposal of waste water; etc.

Importance of using latrines

The single-most important action which families/community can take to prevent the spread of germs is to dispose of faeces safely. Many illnesses, especially diarrhoea, come from the germs found in human faeces. People can swallow these germs if they get into water, into food, onto the hands or onto the utensils and surfaces used for preparing food.

To prevent this happening:

- ***Use latrines.***

  If is is not possible to use a latrine, adults and children should defecate well away from houses, paths, water supplies, and anywhere that children play. After defecating, the

faeces should be buried. Contrary to common belief, the faeces of babies and *young children are even more dangerous than those of adults. So even small children should be taken to use the latrine. If children defecate without using a latrine, then their faeces should be cleared up immediately and either be put down the latrines or buried.*

- ***Latrines should be cleaned regularly and kept covered.***
- ***Keep the faeces of animals away from homes and water sources.***
- ***If the open fields are used for defecation, the faeces should be covered with earth immediately after defecation.***
- ***Wash vegetables before eating them raw.***
- ***Always use footwear, never walk barefoot in the open-especially on grounds used for defecation.***

Hazards of Open-air Defecation

There are several hazards of defeating in the open, like:

- ***Flies carry germs from the excreta to food.***
- ***Drinking water sources are contaminated by people defecating or washing clothes soiled by faecal matter near the water surface.***
- ***Vegetables are contaminated by persons defecating in cultivated fields. If these vegetables are eaten raw, they can cause gastro-intestinal infections.***
- ***Walking barefoot on ground used for defecation can lead to hook-worm infection.***

Improper disposal of rubbish or refuse may lead to gastro-intestinal diseases, which could be prevented by:

- ***storing rubbish in light, washable dustbins with lids to prevent flies and other insects sitting on it;***
- ***emptying dustbins daily into the compost pit and covering the compost pit with ash or mud;***
- ***disposing the rubbish by dumping, composting, burning or feeding to animals.***

Hazards of improper rubbish-disposal

There are various hazards of improper rubbish-disposal, like:

- ***It provides food and breeding places for flies and other insects and rats which carry disease.***
- ***It imparts foul smell.***
- ***It looks ugly and unpleasant.***
- ***It can cause fires.***

Controlling disease-carrying insects and vermins

Breeding of disease carrying insects and vermins like flies, cockroaches, mosquitoes and

rats has to be controlled as it causes diarrhoea, malaria, kalazar and other diseases which take the form of an epidemic and become a threat to the lives of millions. Even when these pests do not spread any infection, they devour valuable food or make it unfit for human consumption. They are also instrumental in spreading plague and typhus. Hence, it is vital to control them via application of the following measures:

- ***Ensure that the rubbish is disposed in a hygienic manner.***
- ***Ensure that sanitary latrines are used for disposal of human excreta.***
- ***Ensure that animal dung is disposed off in a sanitary way.***
- ***Ensure that food is stored in rat-proof containers.***
- ***Trap or poison rats.***
- ***Drain water-collections and prevent the water from collecting in tins, drums or old tyres.***
- ***Treat stagnant water-collections with malariol and spray places infested with mosquitoes with anti-mosquito sprays like D.D.T.***
- ***Keep the water tanks always covered.***

Preventing water-contamination

Unprotected water-collection may get contaminated by humans or animals leading to gastro-intestinal infections. Such water-deposition invites mosquitoes for using it as a breeding place. Apart from all this, it may even cause accidents as some one might slip and fall in the dirty pool of water and small children may even drown in it. To prevent the spread of diseases like cholera, typhoid and diarrhoeal diseases which spread through contaminated water-collections, we must take the following precautions:

- ***Drink water from safe and protected sources.***
- ***Drink Chlorinated water, even though it may taste different.***
- ***Boil drinking water, especially at the start of the monsoons.***
- ***Store water in clean, covered, containers.***
- ***Draw water from containers by using a tap or by a dipper with a long handle.***
- ***Keep the surroundings of water sources free from faecal contamination and other sources of pollution.***
- ***The breeding of the mosquitoes must be prevented by pouring kerosene etc. into water-collections on the verge of stagnation.***
- ***Prevent children from playing near ponds or open wells. Even the adults should be cautioned about the danger of standing on the parapet of open wells.***

Hazards of food-contamination

Unprotected food could be highly dangerous to health as it could be easily contaminated by insects and rats, culminating into gastro-intestinal infections. These people who work at unhygienic eating places may act as carriers of diseases like typhoid or dysentery. If drinking water is drawn from a contaminated source or stored unhygienically, this may again lead to gastro-

intestinal diseases.

Health education regarding prevention of food-contamination must be imparted to teashop owners or roadside restaurants by community members. Even the families in general must take the following precautions like :

- ***Preventing food-contamination by insects and rats;***
- ***Washing vegetables and fruits well before cooking or serving;***
- ***Washing hands thoroughly with soap and water before cooking or serving or eating the food; and***
- ***Using Water from a protected source for drinking, cooking or cleaning utensils.***

Hazards of a smoke-filled kitchen

According to UNICEF, a study in Gujarat villages has revealed that in a kitchen with a smoke-giving chulha (or wood cook-stove), women while cooking inhale 40 times the volume of suspended particles considered safe by WHO. In simple terms, they inhale an amount of carcinogeninc benzopyrene that is equal to smoking 200 cigarettes in barely three hours of exposure, which is much more than the exposure of any industrial worker in his eight hours of duty in any industry. This exposure, apart from causing cancer, also makes pregnant mothers to give birth to underweight and unhealthy babies. Apart from respiratory diseases, smoke-giving chulhas cause irritation of eyes, leading to eye diseases like the conjunctivitis.

Hence, a smoke-less improved chulha is the ideal preventive measure to avoid the above-mentioned problems which a housewife has to go through in a smoke-filled kitchen.

Hazards of Waste Water Deposition

Uncontrolled disposal of waste water, especially sullage water from houses, leads to mosquito-breeding, imparts foul smell and acts as a breeding ground for insects and rats and poses the risk of polluting the water supplies. It is important to educate the community to check the disposal of the sullage water which is mainly kitchen water, water from bathing or washing utensils, sullage water from wells or cattle sheds. It is a community venture where each household must be advised and helped in constructing a soak-pit and also a kitchen garden to utilize the sullage and check contamination.

Chapter 3

REFUSE DISPOSAL : RECOMMENDED PRACTICES

The accumulation of refuse in the house or at the roadside causes health hazards. If these wastes lie around, they attract insects and vermins, make the surroundings dirty, impart foul odour and lead to many diseases. It is therefore vital to get rid of this refuse or garbage in a safe and hygienic manner.

In this context, keeping one's own house clean is every household's responsibility, whereas the onus of the cleanliness of the village or locality per se falls on the shoulders of each and every individual belonging to the community.

Let us first see what do the refuse comprise, so that we can dispose it off appropriately according to its nature.

Refuse is made of garbage, rubbish, ashes, dead animals, street sweepings and even animal-dung. Going into the details :

- ***Garbage generally comprises vegetable parings, animal and fish waste, waste matter left after food preparations, food left-overs and left-over fodder of animals.***
- ***Rubbish is made of waste materials such as bottles, broken glass, paper, tin cans, metal bins, plastic, rubber, etc.***
- ***Ashes consist of left-overs from burning of wood, charcoal and cowdung-fuel.***
- ***Dead animals like dogs, cats or chickens are killed either in a road accident or destroyed deliberately.***
- ***Street sweepings are basically leaves, paper, cigarette butts, etc.***
- ***Animal dung comprises droppings of cows, buffaloes, horses, etc.***
- ***In rural areas, the organic content of the refuse is high. This adds to its value as a fertilizer if proper composting can be arranged (like the NADEP Composting Method given here). In fact, the main mass concern for the appropriate refuse-disposal is due to the following hazards:***
- ***Piles of waste matter act as the breeding spots for flies and other disease-carrying vectors, such as rats. Such rubbish piles also attract pigs and dogs.***
- ***Organic matter present in the rubbish decays and imparts foul odour.***
- ***Such piles of refuse can cause fires, since they are easily inflammable.***

NADEP Composting Technology

This is an ideal technology or method (evloved by the Maharashtra-based Centre of Science for Villages, Wardha) to take care of both the organic household refuse as well as the agricultural refuse in the villages. The agro-waste, for example, consists of rough, dried and hard twigs, stems,

roots, leaves, etc. which could be easily converted into rich, soft, good-smelling compost by using this simple, economical and non-polluting technology. Incidentally, this technology could be easily converted into trade as one man in the village can prepare 30 tonnes of manure annually on his own. It could be easily composted (as shown below).

Construction

1. Aerated Tank :

Construct a rectangular aerated tank of brick masonry in mud and mortar. Dimensions: 10 ft. (L)x6 ft (B) X3 ft (H)

(i) The area on which the tank has to be built should be properly compacted.

(ii) To speed decomposition, the aerated tank should have holes, the distance between each hole being 2ft. x 1ft. (Removing the fourth brick in every third row).

(iii) Plaster the inside and ground of the tank with mud and cowdung. This helps prevent leeching.

(iv) It takes one day to prepare the floor for the tank. Before uning the tank allow the plastering to dry.

2. Material Needed :

(i) *Agricultural waste : 1350 Kg.* (Collection period-October to December and April to June)

(ii) *Gobar (Cowdung): 92 Kg.* (Slurry from the gas plant can be effectively used).

(iii) *Fine dry earth : 1675 Kgs.* (clods, stone, glass, plastic or other undigestible material should be removed).

(iv) *Water : 1350 Litres.*

All this material should be kept ready before we start filling the tank, which should be completely filled and sealed within 48 hours. Partial filling or breaks in the filling process will hamper the composting mechanism.

3. Tank Filling :

The material is filled in layers of fixed quantity, as follows.

1st layer **Agricultural waste:** A 6" thick compact layer of agricultural waste (30 cft. area-100 Kg. weight).

2nd layer **Water & Gobar mix:** The water should be equal to the weight of agricultural waste-100 to 110 kg. (10 to 12 buckets). About 3 to 4% of the water weight or 3 to 4 kg. of Gobar should be mixed well in the water and sprinkled on the garbage-spread, thoroughly drenching it.

3rd layer **Fine earth cover:** Cover this drenched garbage pile with half an inch thick layer of fine earth, weighing 124 Kg. (2.5 cft.)

Continue filling the tank evenly in the above sequence of garbage, Gobar slurry and earth till this pile of composting material is 1.5 cft. above the tank level. Approximately 12 to 14 layers

will fill the tank. The uppermost sealing layer of earth should be 3" thick (15 cft.). This mound of earth is given a smooth finish, by plastering it with Gobar. Small cracks which may appear after drying should be filled with gobar and mud paste.

4. Decomposition :

It will take 60 to 90 days for the compost to mature. For this period, the pit need not be disturbed. A temporary shed (2 to 3 ft. above the tank) will protect the compost pile from direct sun rays and rains and will help in maintaining the humidity.

After 90 to 120 days, the mature compost attains a dark and rich look. It even smells good. For using it, sieve it in a thick mesh to remove the undigested pieces. Now it is ready for use. This one tank of 180 cft. is enough for manuring 6 acres of Land.

Other Methods

Before it is disposed off, refuse should be kept in a dustbin. **Ensure that the dustbin :**

- **has a lid to prevent flies and insects from getting into the refuse;**
- **is small enough to be easily carried when full, but sufficient to collect the household refuse;**
- **is made of material (plastic or metal) which is waterproof, easy to wash, and not easily broken or destroyed by rats, cats and dogs.**

The contents of the dustbin are usually emptied daily into a nearby pit or wasteland.

Collection : In most rural areas there is no public refuse collection system. A member of the family or the family safaiwala collects the accumulated refuse regularly for final disposal. However, where a public system operates, the refuse is usually collected in wheelbarrows and transported from the house to the disposal site. This is usually as near the village as possible.

Frequent collection of refuse is necessary for good sanitation. Long intervals between collections create problems and foul smell.

Disposal : Where a collection system exists, the refuse is disposed off by the authorities concerned.

Community Methods of Disposal :

- **Dumping on land :** If dumping places are available, this is the cheapest method. The refuse is usually burnt to reduce its volume and minimize flies. No soil is used to cover the refuse, so flies and rats abound in refuse dumps. The place is an eye-sore to the community and emits foul smells.
- **Sanitary landfills:** Alternate layers of refuse and earth are placed on a piece of land. This prevents dogs and rats from digging up the buried refuse. This method does not create any nuisance, fire or public health hazard.
- **Incineration:** This requires properly designed incinerators and their proper operation and maintenance. The method is very appropriate for small villages where a number of incinerators could be constructed from locally available materials.

Disposal of House Refuse

- **Burial:** The refuse is deposited in pits and covered with soil.
- **Burning:** Simple incinerators are sometimes used, but usually the refuse is burnt in open grounds.

- **Feeding the animals:** Left-over food and other garbage is fed to chickens, pigs, etc. The non-edible components of the refuse, such as paper, plastic, tins, etc. are separated and are buried or burnt.

Your Responsibilities in relation to Refuse Disposal :

- Educate the community about the relation of refuse-disposal to health. Rural people need to conserve refuse in order to produce manure; this has to be done as near their houses as possible without creating health hazards.

In your educational activities, involve the HG, the village Health committee and the community leaders. Organize individual, small group and large group activities. Some of the topics for education are as follows:

- **The relation of refuse disposal to health.**
- **The diseases which may be caused by insanitary refuse disposal.**
- **Proper utilisation of compost pits to reduce health hazards.**
- **Precautions to be taken to reduce the breeding of flies and other insects and vermins.**
- **The hazards of dumping refuse in water drains.**

Chapter 4

SAFE DRINKING WATER FOR A HEALTHY LIFE

We all know that water is the elixir of life and the second most vital need for survival of the mankind after air. In fact, one could live on food for days but not even a single day without water. Such is the importance of water in our life. Though, it is common knowledge that the safe drinking water can make the difference between life and death but statistics reveal that safe drinking water is also the secret of long life.

According to a recent report of the World Watch Institute of U.S.A., **"One of the first and foremost basic changes that lengthens life expectancy is the supply of clean water."** This is the reason why today the average human life expectancy which is now 65 years, has increased by almost 20 years since mid-century according to a recent report of the United Nations.

Safe drinking water is one of the main reasons which has brought a small state like Kerala at par with the wealthy western nations in terms of life-expectancy. Datawise, Kerala enjoys average life-spans of 73 years for women and 67.5 years for men, which is as high as in the rich countries, whereas its gross national product is even less than 400 American Dollars (or 12000 Indian Rupees) per person.

If you turn back the pages of history, you will discover that it was not until the middle of the nineteenth century in Europe that life expectancies first began to lengthen due to a marked improvement in the quality of drinking water.

History reveals that improved water and sanitation in 1844 spurred longer life-spans for the inhabitants of Lyon in France. Even Paris followed suit a decade later, enjoying a rise in life-expectancies. Marscilles also witnessed an upward trend in terms of longer lives with the advent of water-improvement programmes in 1885.

The fact remains that till the 1830, even the North or developed countries of the West had an average life-expectancy not more than 40 years. The poor South or the developing nations, on the other hand, did not pass the 40 year life-span mark even upto the mid-forties of the present century.

According to the United Nations Development Programme, **"Even in the Nineties, more than half of all the Africans living in the south of Sahara, almost 50 percent of all South East Asians, 30 percent of South Asians, and nearly 20 percent of Latin Americans lacked safe-water".**

It is a heart-warming revelation that today, the life-span in the Third World has shot up to the age of 63 years which is not far behind the average life-expectancy of 73 years as enjoyed by the people of the North.

According to a recent report (termed: "A Review of Situation of Children in India") by India's Ministry of Human Resource Development, published in 1993, the estimated life-expectancy of an average Indian at birth in the year 2001 is 64.5 and males at 64.1. The major contribution which may make Indians achieve a life-expectancy of 65 years by the close of the century is that of clean, safe drinking water, apart from additional health inputs.

Unfortunately, with the mere aping of the West under the guise of modernism, we are losing our traditional wisdom pertaining to the purification of water by using natural coagulants like the

Nirmali seeds. Even NEERI or the Nagpur-based National Environmental Engineering Research Institute has confirmed that ***Strychnos potatorum*** or the seed of the Nirmali tree cleanses muddy water by coagulating the suspended particles, which settle at the bottom, leaving crystal clear water at the top. ***Choti Elaichi*** leaves, ***drumstick*** seeds (Moringa Olifera) and many other herbs and roots which are locally available have been traditionally used in Rural India since ages. The marriage of the new scientific discoveries with the traditional water-purifying technologies is a must for providing safe drinking water for all to realize the goal of the UN Drinking Water and Sanitation Decade, by the year 2000.

According to the WHO, **"More than half of all illnesses and deaths among young children are caused by germs which get into the child's mouth via drinking water and food".** In communities without safe drinking water, proper latrines and appropriate refuse disposal, it is very difficult for the families to prevent the spread of germs, disease and finally - death. Diarrhoea, which originates from lack of clean drinking water and poor hygiene, kills 1.5 million children every year in India alone. It is a major cause of child malnutirtion, culminating into dehydration and death.

"Diarrhoea contributes to roughly 25% of mortality in the under-five age group in India", confirms India's Ministry of Health. Illnesses due to the intake of unsafe drinking water could be avoided by families who have a plentiful supply of safe piped water or water from a tube well or deep hand pumps, and the know-how to use it.

Families without a safe water supply can reduce illnesses if they protect their water supply from germs by:

- *keeping the wells covered;*
- *keeping faeces and waste water (especially from latrines) well away from any water used for cooking, drinking, bathing, or washing;*
- *keeping buckets, ropes and jars used to collect and store water as clean as possible (for example by hanging up buckets rather than putting them on the ground'.*
- *keeping animals away from drinking water.*

In the home, families can keep the water clean by:

- **storing drinking water in a clean, covered container;**
- **taking water out of the container with a clean ladle or cup;**
- **not allowing anyone to put their hands into the container or to drink directly from it;**
- **keeping animals away from it (rather, out of the house).**

Illness can also be prevented by boiling or chlorinating water if it is not from a safe source such as piped supply, tube-well or deep hand pump. Even if the water seems clear, it may not be free from germs. The safest drinking water is from a piped supply, tube well or a deep-bore hand pump. Water from other sources is more likely to contain germs.

Boiling the water kills germs. So, if possible, water drawn from sources such as ponds, streams, springs, wells, tanks or public stand pipes should be boiled for about five minutes and cooled before drinking. It is especially important to boil and cool the water given to babies and young children, since they have less resistance to germs than adults.

If boiling is not possible, drinking water could be chlorinated prior to its intake. Another possibility is storing drinking water in a closed or covered glass container and leaving it standing in sunlight for two full days before using it. Scientific studies have revealed that such an exposure to sunlight kills more than 90 percent of the germs in the water, thus making it safe for drinking purposes.