FOOTSTEPS

No.9 DECEMBER 1991 SANITATION

IN THIS ISSUE

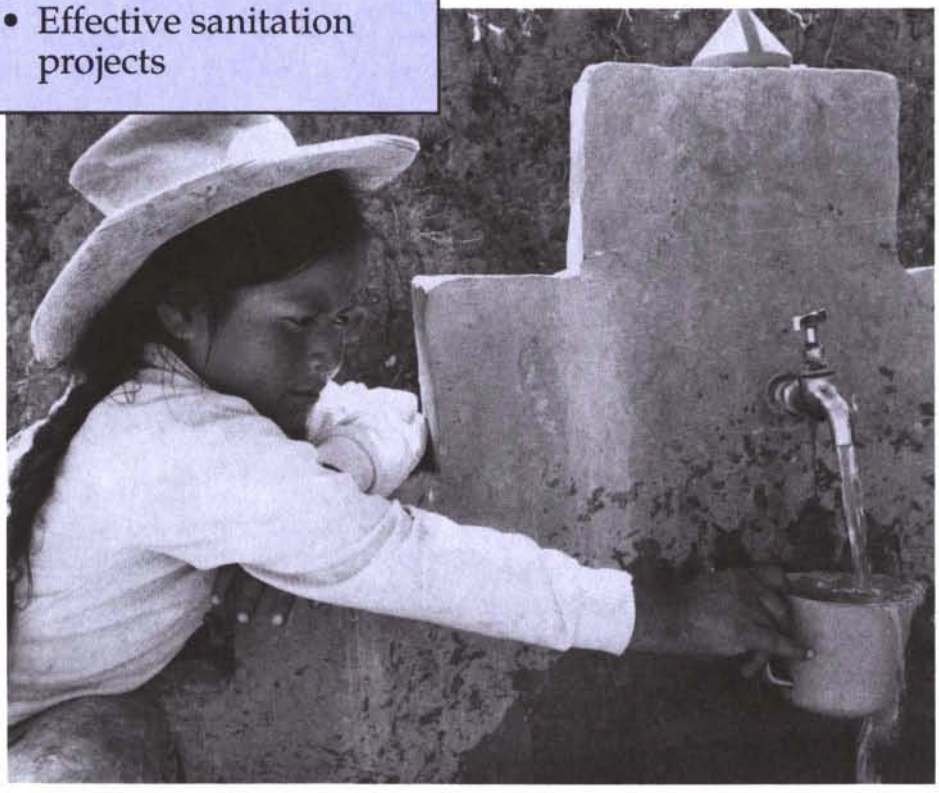
Disease and Sanitation:

action in low-income communities

by Professor John Pickford of the Water, Engineering and Development Centre at Loughborough University of Technology

IT IS OFTEN SAID that much of the disease in low-income countries is caused by bad water. Water-related diseases, so we are told, cause the deaths of many millions of children each year and occupy most of the hospital beds in developing countries. Diarrhoea in its various forms is a killer, as well as causing pain and suffering.

Water quality is unfairly blamed for all these problems. However, nearly all so-called water-carried diseases, from quick-killing cholera to uncomfortable stomach-ache, are really spread through poor hygiene and sanitation practices. Lack of sanitation may mean that water is contaminated but these diseases are also passed on in other ways. The diagram on page 2 shows some of the other ways in which diseases can be spread from the faeces of the infected person to other people.



Poor water quality is often unfairly blamed for the spread of many diseases. But it is poor sanitation which is the real cause of the problem.

The spread of disease

In Tanzania a medical officer told me about his investigations into the quite serious cholera outbreak in the mid-1970s. He had tried to work out how the infection spread. In one rural area a map marked with cholera cases showed clearly that all were along a stream used as water supply. Once the stream was polluted by cholera bacteria, people downstream were likely to be infected. But in Dar es Salaam (the capital city) he could find *no* connection between the epidemic and water. Here it seemed many women had contracted the disease while tending sick relatives and carrying out rites on those who had died. Their hands had acted as the carrier.

FOOTSTEPS

Footsteps is a quarterly paper linking health and development workers worldwide. Tear Fund, publisher of *Footsteps*, hopes that it will provide the stimulus of new ideas and enthusiasm. It is a way of encouraging Christians of all nations as they work together towards creating wholeness in our communities.

Footsteps is free of charge to individuals working to promote health and development. It is available in English, French and Spanish.

Readers are invited to contribute views, articles, letters and photos.

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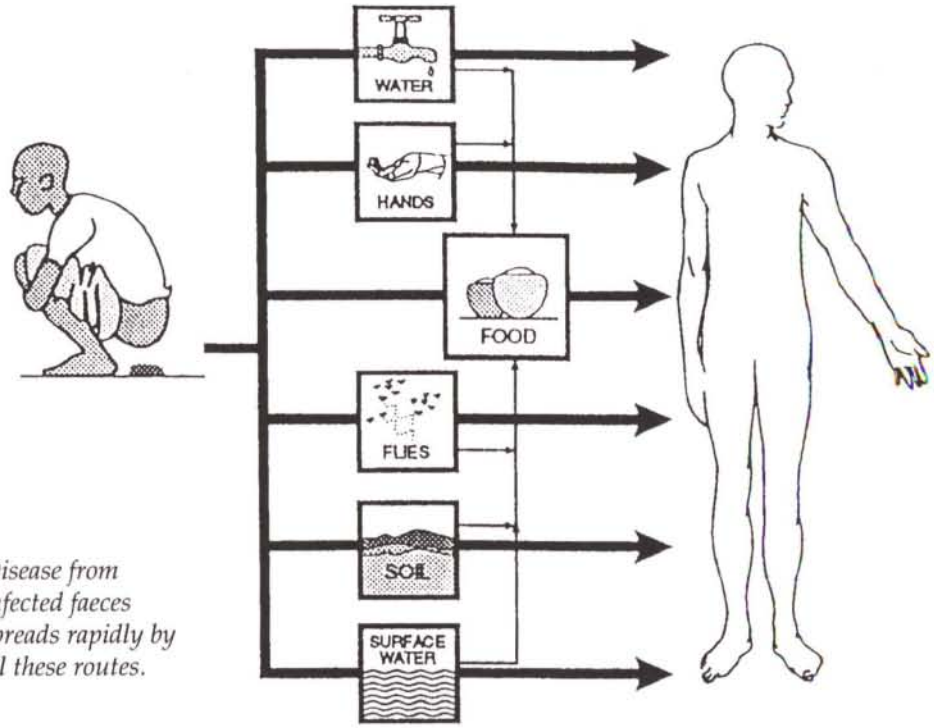
CHRISTIAN CONCERN IN A WORLD OF NEED



Disease from infected faeces spreads rapidly by all these routes.

Washing hands

In this example, as in many others, a lack of water for washing helped the spread of disease. Thorough washing of hands is so important in preventing the spread of infection. Washing with soap or ashes is best, but the essential thing for good health is to have enough water. Water for washing does not have to be of the same quality as drinking water.

Flies

Flies are also responsible for much of the spread of disease. Cockroaches are sometimes to blame too, but flies are the real villains. The trouble is that they like feeding on faeces. They can also travel long distances. Flies have spikes on their legs, so particles of whatever they feed on are carried away. If their food is faeces of someone suffering from a diarrhoea-type disease such as cholera (rare) or gastroenteritis (common), these particles may pass on the disease to others. Their next meal is quite likely to be on human food. So little bits of faeces are left behind on food or drink which is to be eaten by people. The disease is passed on.

Diseases spread through soil

Another route is in soil. This is very important for intestinal worms such as roundworms and hookworms.

Children with roundworms often relieve themselves while crawling or playing in an unpaved compound. The faeces are likely to contain roundworm eggs. Even if someone cleans the compound, some eggs probably remain in the ground. Other children get some soil on their hands – children everywhere get dirty when playing. Then fingers go in mouths because children everywhere suck their fingers. The roundworms are passed on. One of the problems with roundworm eggs is that they remain infective for a very long time – many months. When children (or adults) with roundworms defecate on the ground near food crops, soil containing eggs can also easily get onto the crops many months later. Roundworms can then be spread through the food.

Disease spreads very easily

When particles of faeces from someone with a so-called 'water carried disease' are passed on by water, hands, flies or the ground, the disease may be transmitted to someone else. A tiny amount of faeces is enough. People excrete several thousand million micro-organisms every time they defecate. Most of these organisms are harmless, but it only requires a few of the dangerous ones for fresh infection.

The value of sanitation in preventing disease

The aim of sanitation is to block all these ways of spreading disease. This diagram shows how good sanitation prevents the micro-organisms in faeces from spreading disease.

It is important to reduce hand contact with faeces. Washing hands well after contact with faeces *must* go together with sanitation to reduce all risk of disease transmission. Washing hands is particularly important after cleaning a baby's bottom. It is often wrongly assumed that the faeces of young children are harmless.

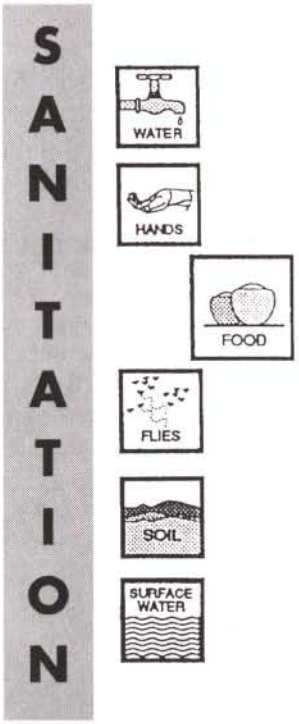
The use of latrines

Where there are no latrines people have to relieve themselves in the open. They may do this at any nearby place – in fields or the bush, on the roadside, beside railway lines and canals, on any vacant land. As villages and towns grow it becomes increasingly difficult to find places to defecate in private. Privacy is usually more important for women than men. The destruction of trees and other vegetation (an environmental problem in many parts of the world) adds to these difficulties. No trees or bushes may mean no natural screen to give privacy.

Most people want to keep the immediate surroundings of their homes clean, so it is necessary to go some distance from home to defecate. In some circumstances this may be acceptable. However, in bad weather, having to walk half a kilometre may be very inconvenient. It may be difficult or impossible for the old or infirm, or for young children whose faeces are often particularly dangerous. A long walk is especially difficult for anyone suffering from severe diarrhoea.

Until the 1960s a common method of dealing with excreta in many Third World towns was the dry latrine or bucket latrine. If well run, the system was reasonably satisfactory for the user. Users defecated into a bucket or other container that was regularly emptied. Emptying was often carried out at night; hence the name 'nightsoil'. There are still many such latrines, although they are a serious health problem. The system involves handling of fresh excreta and there is much nuisance from smell and flies. Excreta is spilled near the latrine and along the routes used by the nightsoil men.

Effective sanitation completely blocks the transmission of disease from faeces.



Advantages of pit latrines

Wealthy urban areas may have WCs, sewerage and proper sewage treatment with piped water supplies. However, for the majority of people in both urban and rural areas, this is out of the question.

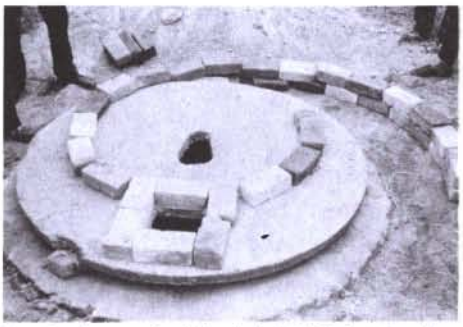
For most people the best sanitation solution is some form of pit latrine. The pit is simply a hole in the ground to hold faeces. There is no pollution of above-ground water or the soil and disease is not transmitted through these routes. There is no need for fresh excreta to be handled.

Faeces decompose and are converted to gases and liquid, leaving solid remains. The gases escape to the atmosphere or into the soil. If the surrounding soil is suitable it soaks up liquid from decomposition, plus urine, water from cleaning the latrine and a small amount of other waste-water put into the latrine.

The solids that remain gradually fill latrine pits. A pit may last for a long time if it is large and ground conditions are favourable. I have examined many pit latrines in East Africa that have been used by large families for more than twenty years, have never been emptied and seemed to have plenty of space left for future use.

There needs to be some support over the pit for users to squat or sit. This 'slab' needs to be strong enough to support the user's weight. If it has a rough surface (as when made of unplaned wood or mud) it may provide a suitable residence for hookworms. A smooth concrete slab is ideal – it is strong and easy to clean.

Building a twin pit pour-flush (water-seal) latrine. (Photo: Philip Wan, UNICEF)



Beginning to build a brick VIP latrine in Zimbabwe. (Photo: Peter Morgan)

More about flies

Fly-breeding in pits is a health hazard already described. This is not a great problem with a very deep pit with a small squat hole. But flies can be a serious problem with a shallow open pit or a nearly full deep pit. There are three ways of controlling this fly nuisance...

The cheapest is to make a lid that fits exactly in the squat hole and to make sure it is always replaced when the latrine is not actually being used. In Mozambique a low-cost, slightly domed, unreinforced concrete slab is popular. The squat hole is keyhole-shaped. In the keyhole a lid is cast, made of concrete with a wood handle. This type of latrine can be made with a cheap shelter for privacy – grass matting is sufficient.

In Zimbabwe thousands of 'Ventilated Improved Pit' latrines (VIPs) have been built. VIPs require a latrine building with a roof and cost much more than the Mozambique-type latrine. The pit is ventilated by a pipe or chimney with fly-proof netting at the top. Hundreds of flies may hatch in the pit from eggs laid by one or two mother flies that manage to get in. They are attracted by light at the top of the vent, while the latrine building is darker. Unable to get through the netting, they die.

The third method of controlling the fly nuisance can be used where people use water instead of paper or leaves for cleaning themselves after defecation. A trap with a water seal is fitted below a shallow pan. The trap is like that in a WC but not so deep. It is flushed by pouring a small quantity of water. Flies, mosquitoes and smells in the pit are all effectively trapped by the seal, with obvious reduction of health risks.

Emptying

A final point to be considered is what happens when a pit becomes full. In rural areas a new pit can be dug but this may be impossible on small urban plots. Emptying a recently-filled pit with buckets exposes the workers to health risks. A few fortunate towns have special vacuum tankers for emptying pits. An idea which has been found helpful in many other places is to make two small pits or to divide one pit into two sections. One section or pit is used for two or three years, and then the other. By the time the second pit is full the excreta in the first pit will be quite safe to take out by hand.

Full details of how to build all the various types of latrines mentioned are contained

FROM THE EDITOR

SANITATION – not a subject any of us enjoy talking about! Because of this, it is easy to ignore the problems that poor hygiene and sanitation bring. We prefer to look at other ways of improving health which are easier to talk about. But lack of good sanitation is a huge health problem. The whole community suffers – all of us reading this have suffered from some of the unpleasant illnesses caused by poor sanitation. Does our love for our neighbours (Matthew 22:39) include improving poor sanitation around our homes?

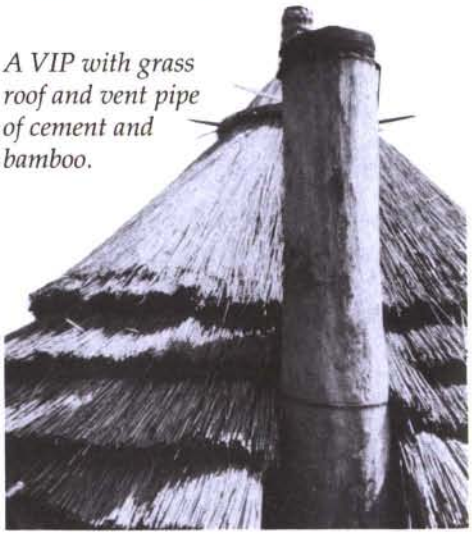
Professor Pickford gives an introduction to the whole subject and the vital importance of pit latrines. Isobel Blackett gives practical advice on how to encourage successful sanitation programmes. There is plenty of advice on how to go about finding the right kind of pit latrine for your community and how to build one. Please let us know if this issue has been of practical use.

We need to practise good health and sanitation to keep our bodies healthy and our surroundings clean. In the same way, farmers need to do the same to keep their crops healthy and to control pests and diseases. John Wibberley and Dr Igbinnosa look at the effect of weeds and, in particular, one very serious problem.

Future issues will look at small livestock, simple accounting and health workers. Please write in with any views you have on these subjects. I hope you continue to find *Footsteps* a practical encouragement in your work.

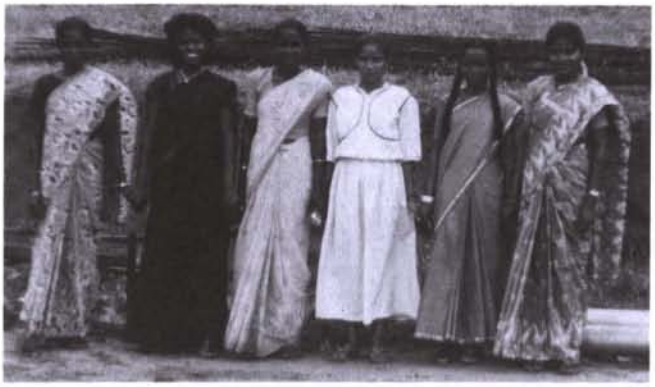
Isabel Carter

Preparing to make an un-reinforced domed concrete slab. (Photo: R Franceys)



A VIP with grass roof and vent pipe of cement and bamboo.

Eliazar T Rose sent in this photo of the small group of health workers in her area of Orissa, India, with their thanks and appreciation for Footsteps.



Neem in the treatment of scabies

I was very interested in the article on the use of the Neem tree in a recent issue of *Footsteps* and would like to share with you how this tree is used in Bangladesh as a natural health aid.

For the treatment of scabies we teach a home treatment which is traditional:

- Boil some Neem leaves in a pot of water.
- When the water turns green remove the leaves and grind them together with a piece of raw turmeric root.
- Use the water to bathe the child, then apply the paste to affected areas. This is done for three days.

Neem leaves can be dried and crushed to a powder, then stored in a tin. A little can be eaten with rice every day until the scabies is cleared. An Indian proverb says: 'If you eat the leaves of the bitter Neem your life will be sweet'.

Ethne M Flintoff, The Salvation Army, Jessore, Bangladesh

The use of Neem

I would like to make a few comments on the use of the Neem tree. I think it is a very useful tree for many farmers who cannot afford to buy chemicals.

In my experience, using the seeds of Neem is not nearly as practical as using the leaves. Leaves dried in the shade can be pounded to powder and mixed with water as a spray, or just used as a powder insecticide.

The article advises drying the leaves in the shade, but I would also recommend the *seeds* be dried in the shade, since the active ingredient in Neem (azadirachtin) is broken down by ultra-violet light (in sunlight).

It is also important to stress that the use of Neem does not show immediate results. Pests do not drop dead straight away. It acts as a repellant and also inhibits the growth and development of the insects who eat it. Over time it is very effective, but farmers expecting quick results may be disappointed and stop using it before realising the long-term benefits.

Neem also has many other useful properties. In Sudan we found the leaves very useful as chicken litter since this controlled fleas and lice. The fresh leaves, if fed to goats, will control worms.

The Neem tree is a tree that should be encouraged in any treeplanting programme because of its many uses. However, the seeds are difficult to propagate because they quickly lose their viability. In Sudan we found it best to dig up wild seedlings from under established trees and transplant them into polythene tubes.

I hope these comments are helpful. I find *Footsteps* a very useful magazine in my work.

Dr Roger Sharland, OAIC/RDE Coordinator, PO Box 21736, Nairobi, Kenya

Collecting water from thatched roofs

Many thanks for *Footsteps* – it's been very useful and interesting indeed. They are particularly helpful to the supervisors we are training in community health.

We have a query which we hope someone may be able to help us with. The ferro-cement water tanks sound absolutely wonderful (*Footsteps No.1*). Unfortunately, 99% of the homes here have a thatch roof. The water falling from these has a dreadful colour and tastes quite unpleasant.

How could we make a gutter around the roof to catch the water to lead it into the tank, and is there any way in which we could improve the taste?

We do hope someone might be able to help us.

Marie-Christine Lux, Rafai, Central African Republic.

Units for water-seal latrines...

These are usually readily available in the countries where this kind of latrine is commonly used. They are made from plastic, cement or pottery and usually not too expensive. Water seal units *can* be made using cement and moulds, but the rough surfaces resulting are often hard to clean.

This group of potters in Bangladesh, the Kumrakapon Kumvoker group, were trained in just two weeks to make parts for pit latrines. Now they successfully produce these parts very cheaply to meet a growing demand.

ANASTAUSIA'S KNOTTY PROBLEM

by Dr Steve Brown

I WOULD LIKE to open the discussion about the knotty problem of women like Anastausia who are given oxytocics, either by village healers, in the form of roots ('Knotty Problems' in *Footsteps No.7*) or, as I have seen in Bangladesh, by village 'doctors', in the form of oxytocin injections or tablets. The problem, of course, is that oxytocics are powerful stimulants of the muscles of the womb and that, when given in a high or uncontrolled dose before the baby is delivered, can cause the womb to burst.

I feel that we should avoid too quickly criticising and blaming either the healer or the woman, and we should avoid coming up with quick and easy answers. We need to make sure that whatever advice we give is actually relevant to the people and is possible to follow. We should observe the simple rule of seeking more information about the problem.

People are not generally stupid; they do things that are logical within their own understanding of the problem and in keeping with their own values and beliefs, and we should respect them for this. In this case we may need to find out the beliefs regarding:

- the length of pregnancy
- the best time for delivery
- where and how women should be delivered
- who should be present
- spirits associated with labour and child-birth.

People's attitudes towards the health service are also influenced by their past experience of it. Is a visit to the local health centre a 'positive' experience or is it time-consuming, humiliating and seen as unfruitful? Is the service readily available and affordable?

With this information we should be better able to imagine ourselves in the position of the pregnant woman. The solution may be more to do with changing our service than with expecting other people to behave differently. It would be ideal if the plan of action could be discussed with village healers, groups of women and local midwives, and not just presented to people as 'the solution'.

We should find out exactly what is being given to women and for what reasons. If oxytocics are being used to start labour, the answer probably lies in agreeing with village women, midwives and healers during training sessions or discussions that:

- Babies will come when ready; if the baby appears to be late then probably the dates are wrong.
- Labour should not be induced at home because the dangers are very great.
- If you think your baby is more than two weeks late go to the hospital for advice.

If oxytocics are being used to speed up labour, things are more complicated and some simple local research may be needed. In my experience in Bangladesh, most cases of delay in labour were due to exhaustion and dehydration of the mother. Both midwives and women may need training in encouraging food and drink during the first stage of labour, and not 'pushing' too early. If the village doctor has used oxytocics in such cases he may have helped many babies to deliver. However, if he has used them when the baby was in the wrong position or the baby's head was too big for the mother's pelvis, he may have ruptured a uterus.

The woman in the village is in a very difficult position – doctors are often unwilling to attend delivery cases in the community and the woman already in labour doesn't want to be moved. No wonder she uses local medicines first.

The answer, in the end, probably lies with:

- antenatal screening of women to find out those at risk from difficult labours
- training of village midwives, not just in doing deliveries but in recognizing problems in delivery at an early stage so cases can be referred quickly
- working together with village doctors and healers to recognize the risks of oxytocics and to control the use and doses more carefully
- making health services readily available and improving transport facilities to hospital.

Would any other readers like to comment from their own experience?

Steve Brown is a doctor with many years experience in Bangladesh with Tear Fund.

Planning a pit latrine

Compiled by Richard Franceys and Isabel Carter

When the decision to build a pit latrine is made, then there are many things to consider...

THE TYPE OF LATRINE

This depends on how much money is available and whether people use water or solid materials for cleaning themselves...

- a *water-seal latrine* (where people use water)
- a *simple pit latrine* with a sealed cover
- a *ventilated latrine* with a pipe to take away the smell and keep out flies.

WHERE TO BUILD IT

A well built latrine can be built next to the house. You may prefer to choose a site a little further away from the house. But it is very important that the latrine must be at least 15 metres downhill from any water source.

HOW TO CONSTRUCT IT

- *Hard, firm soil* – no lining is likely to be needed.
- *Rocky ground* – you may need to build a mound up around the pit with steps leading up to the latrine.
- *Soft, loose soil* – you will need to line the pit to prevent the sides from falling in. The lining can be just for the upper half of the latrine or, if necessary, all the way down the pit. You can use all kinds of different materials to line the pit: bricks, blocks, oil drum, concrete rings, bamboo or similar basketwork, stones.

Circular pits are more difficult to dig than rectangular pits but they will be stronger and less likely to collapse.

ONE OR TWO PITS?

You can dig a single pit under the latrine. This is usually about 3 metres deep. If the latrine will be used by many people or if the soil is too hard to dig so deeply, then it will be a good idea to build two pits side by side. These need only be one metre deep. When one pit is full then the other is used. After a year the material in the first full pit can be safely emptied and used as manure.

With a water-seal latrine, the two pits can be connected by pipework. The pipe to the pit not in use is simply blocked using a stone. With a dry pit latrine, two covering slabs will be needed.

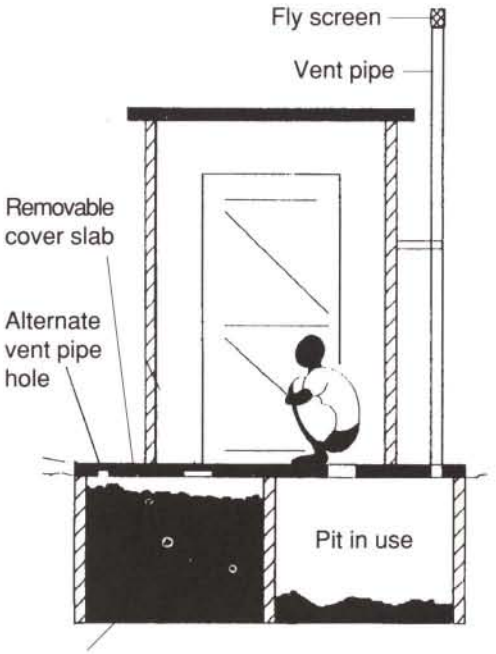
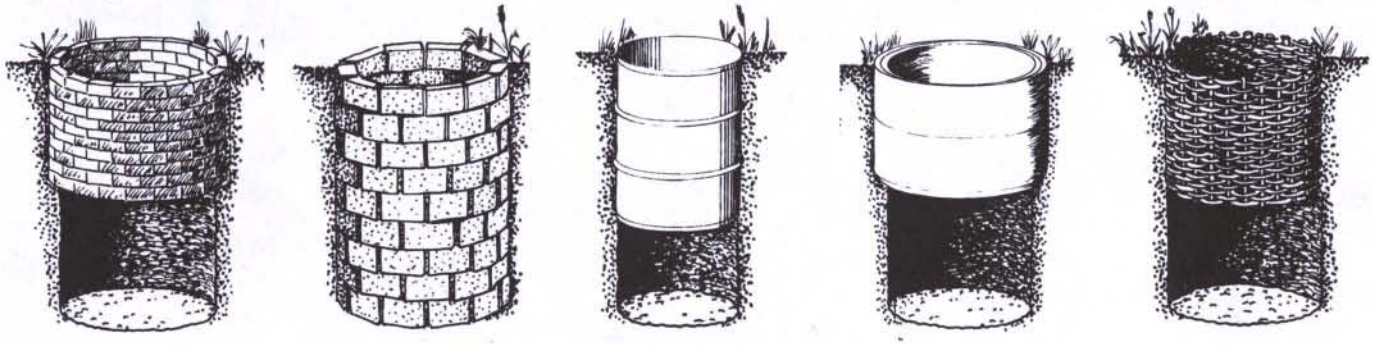


Diagram: R Franceys

Lining materials...



Building a pit latrine

DIGGING

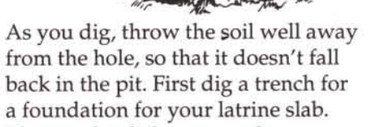
As you dig, throw the soil well away from the hole, so that it doesn't fall back in the pit. First dig a trench for a foundation for your latrine slab. This need only be two or three courses of brick deep (or one concrete block). Build the foundation wall, let it become hard and then dig your pit down inside the foundation wall.

If you are lining the pit after it has been dug, make a guide frame by tying or nailing together pieces of wood or bamboo to the chosen size. this will help you dig straight, reducing the amount of lining material required. An octagon (8 sides) is a good guide for a round hole.

If you are lining part of the pit, stop digging when you get to the chosen depth of lining, then build the lining before you continue digging down.

THE COVERING SLAB

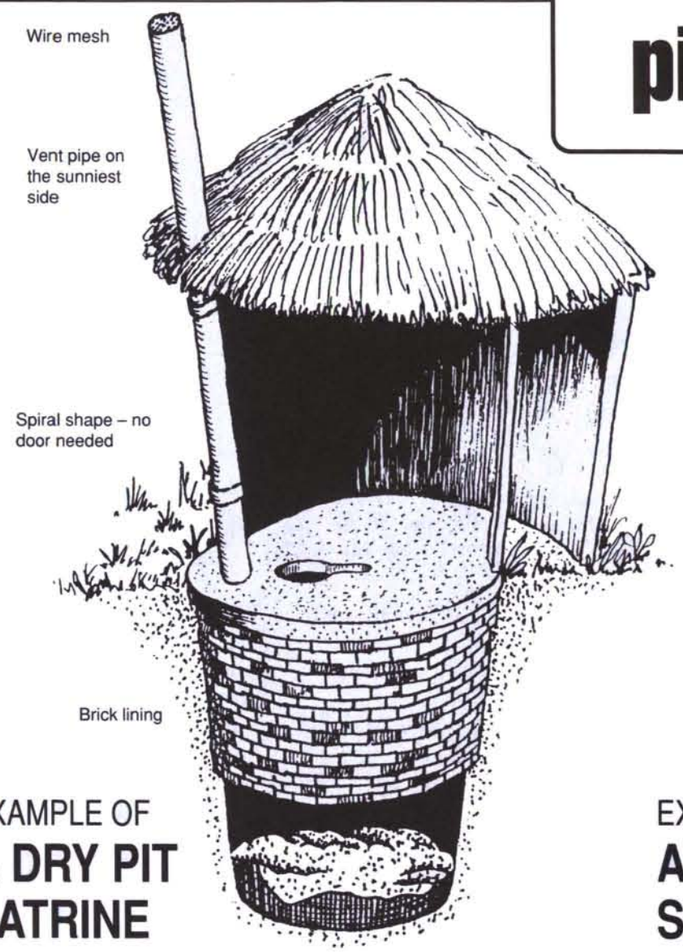
Reinforced concrete slabs (circular or two-piece rectangular for large pits)



Make sure the slab will be much larger than the pit, so there is no danger of collapse.

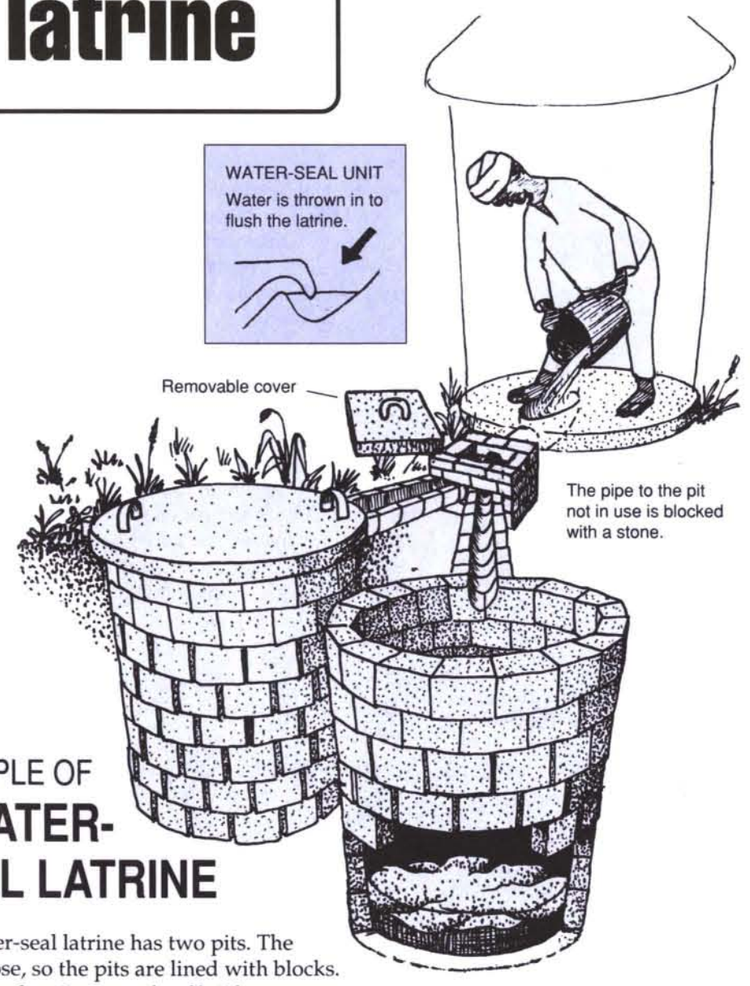
You can build the covering slab out of wood or bamboo, covered with mud, but then there is some danger of hookworm infection through the mud.

You can use moulds to make a concrete slab. If you are building a VIP latrine, the slab will contain a hole for the pipe. Make sure the squat hole is too small for a young child to fall through. A brick is a useful guide for size.



EXAMPLE OF
A DRY PIT LATRINE

This diagram shows a Ventilated Improved Pit latrine (VIP) with a single pit using brick lining for the upper part. It has a spiral shape with thatched roof and mud walls.



EXAMPLE OF
A WATER-SEAL LATRINE

This water-seal latrine has two pits. The soil is loose, so the pits are lined with blocks. Pipes into the pit are made of bricks.

VIP LATRINES

VIP Latrines must have a pipe or a chimney connected to the pit. The pipe should be higher than the roof of the latrine or any nearby building. The pipe must be well covered with stainless steel or glass fibre wire mesh to catch flies and mosquitoes. Ordinary wire mesh breaks up too quickly.

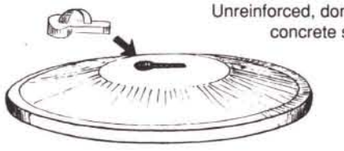
The latrine should be designed so that the pipe is on the sunniest side. All smells will be taken away up the pipe. Any flies or mosquitoes which get into the latrine will be attracted to the light up the pipe but, unable to get out, will then die. The inside of the latrine will be darker either because there is a door, or because of the spiral design of shelter.

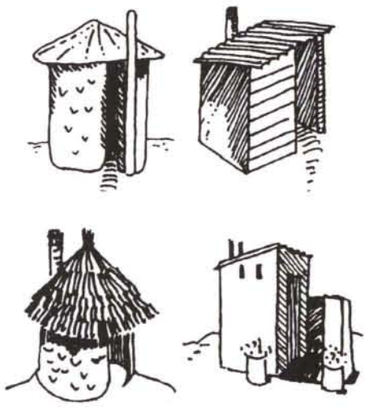
CHILDREN'S LATRINES

Young children are often afraid to use a latrine, or find it difficult to manage. An alternative idea for very young children is to dig a very shallow pit (just half a metre deep). Make a slab to cover the hole with a tight fitting cover. No shelter is needed. Encourage children to use this, and add soil regularly to keep flies away. As the hole fills up, dig another small hole and move the slab.

THE COVER

VIP latrines and water seal latrines do not need covers. Other types of latrines **should always have a tight fitting cover**. Covers can be made out of wood, or cement. If they are used right from the beginning, then the problem of flies and mosquitoes will be greatly reduced.





THE SHELTER

The shelter can be built from any available local material: mud walls and thatch, bricks or blocks with a tin roof, a simple grass screen, ferro cement walls with thatch or tin roof.

The shelter may be a rectangular shape with a door. If people are unlikely to keep the door closed, a better design is to build a spiral shaped shelter. This does not need a door but still provides privacy.

KEEP THE LATRINE CLEAN

Wash the latrine regularly with a brush and soapy water. (Rinsing water from washing is ideal.) Make sure that hands are washed each time the latrine is used.

Take pride in your latrine. The benefits to your family's health are enormous! Encourage all your neighbours to follow your example.

New ideas in the control of mosquitoes

Compiled from material from DCFRN and Dr Chris Curtis

MOSQUITOES carry diseases from one person to another. They are also a great nuisance. Some varieties carry malaria (*Anopheles* species), others dengue fever (*Aedes aegypti*) and others a disease known as filiariasis which causes elephantiasis (*Culex* species).

Mosquitoes lay their eggs in water and the mosquito larvae develop there. They use water that has collected in something as small as an old tin can or as large as swampland.

It is very important to reduce the amount of still water around the house so that mosquitoes will not be able to find so many places to lay their eggs. Cover barrels and containers which hold water for drinking, washing and bathing. Do not leave things lying around which could hold rainwater, such as old cans, bottles, pots and tyres. Clean drains so that water can flow easily. Fill in puddles with sand. Consider building a drainage pit or soak-away if water collects in puddles around where washing or cleaning is done.

However, some areas of water are difficult to cover. These include pit latrines, cess pits and disused wells. Sometimes a small quantity of oil has been added to water to control mosquitoes. Mosquito larvae breathe air through the water surface and the layer of oil floating on the surface would prevent them breathing and kill them. However, the oil slowly breaks down and is expensive to replace. Another kind of solution is needed.

Expandable polystyrene beads are produced for use as packing and insulation material. Polystyrene is a very light material which floats on the surface of water. Experiments were carried out using different sizes of these polystyrene beads. The beads would float on the surface of the water forming a thick 'carpet'. When smaller beads were used (ideally 2mm in diameter), the mosquito larvae were unable to breathe through this layer. If pit latrines dried up during the dry season the beads would again float to the surface once the rainy season began.

The beads will also last for many years. When small beads are used the layer of beads does not need to be more than 1cm thick to destroy all the larvae. If larger diameter beads are used then the layer may need to be 2 to 3cm thick.

Tests were carried out in the town of Makunduchi, Zanzibar, in Tanzania. The town had about 1,700 pit latrines and cess pits, of which about a third contained water and mosquito larvae. All pits known to contain water were treated in 1988. The following year there was a huge reduction, 98%, in the biting population of mosquitoes.

The type of mosquitoes which breed in these deep pits is not usually the malaria-carrying type of mosquito, but the *Culex* type which carry filariasis and cause great nuisance from biting.

There have been no complaints about pollution or any other problems from the use of the beads. This experiment is now being extended to cover the whole of Zanzibar town. The beads are available in the town, free of charge (thanks to a donation from the Shell Company). Information is given about how to use the beads and apply them. The beads can be supplied in their unexpanded form which looks like sugar. On heating, either in a nearby factory or simply in householders' cooking pots, the beads will expand by thirty times, ready for use.

There have been some mis-understandings. People sometimes think the beads should be put down *all* pits – even those which are never wet. Some people have believed that the beads were some kind of poison and that a small handful would kill the mosquito larvae.

Groups interested in purchasing quantities of expandable beads can write to:

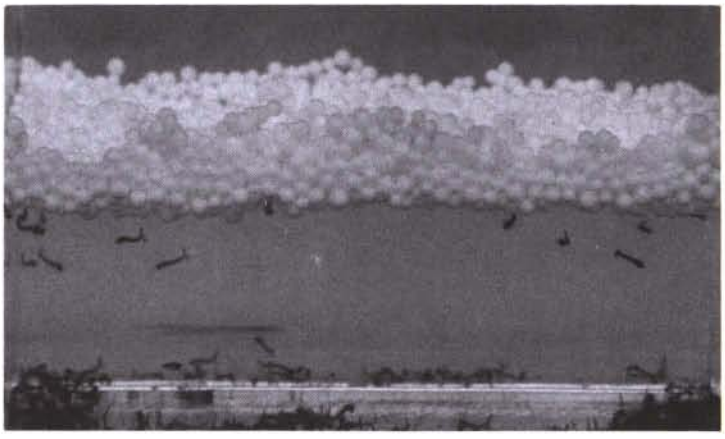
Shell International Chemicals
(Attn Peter Taylor, Dept CTMP/24)
Shell Centre
London
SE1 7PG
UK,

asking for details of *Styrocell Grade R543 FE*, or to

BASF
(Attn Jost, LAV/KA)
Ludwigshafen
Germany,

asking for details of *Styropor Grade P355*.

The unexpanded material is usually

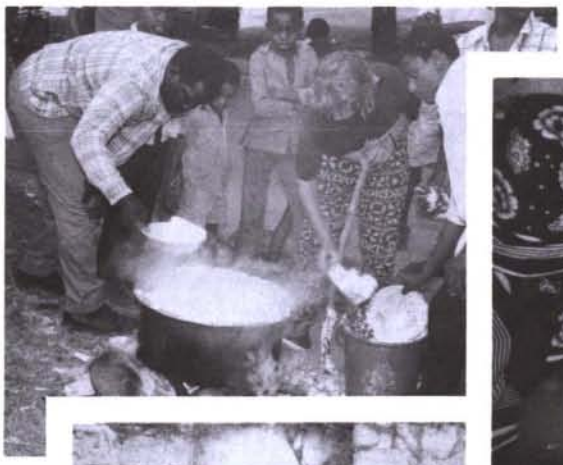


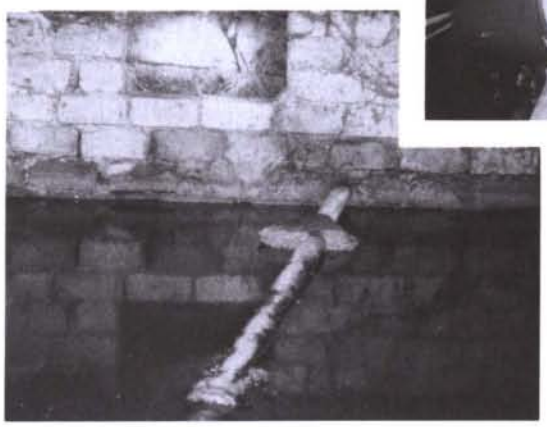
Mosquito larvae unable to breathe under a thick carpet of beads.

available in drums of 125 kg (enough for 50–100 pits) which must be kept sealed until needed.

It might be worth finding out if this material is available in your own country first. Another possibility, if only small quantities of polystyrene beads are needed for one household pit latrine, would be to try to obtain polystyrene packaging material from a dump or from shops supplying electrical goods. Some packaging material will crumble easily and could be used. This would not be as effective as the beads, but simple experiments have found that a thick layer of this crumbled material prevents the larvae from emerging into mosquitoes, although it is not so effective at preventing them from breathing.

Dr Chris Curtis works in the Department of Medical Parasitology at the London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, UK.





(Top left) Expanding the beads in boiling water in cooking pots.

(Above) Applying the beads to a flooded cellar.

(Left) 10,000 mosquitoes were found leaving this cellar at dusk!

BIBLE STUDY

by Brian Skinner

THERE IS VIRTUALLY no teaching in the Bible directly concerning sanitation except that found in **Deuteronomy 23:12-13**. These verses in the NIV Bible read:

> *'Designate a place outside the camp where you can go to relieve yourself. As part of your equipment have something to dig with and when you relieve yourself dig a hole and cover up your excrement.'*

The next verse talks about how this command was given to keep the camp *holy*, but the practice would also have kept the camp *healthy*.

Burial of excrement is the simplest of all sanitary measures, but finding a convenient place which had not been used before when there were so many Israelites camping in the same area, sometimes for long periods, would have been very difficult. Just think of refugee camps today! Privacy, something which Saul looked for when he went into a cave to relieve himself (2 Samuel 24:3), would also have been hard to find.

Although the links between excrement and disease were probably unknown to the Israelites, their feelings about 'uncleanness' probably made them very careful to avoid contact with faeces. Ezekiel resisted the Lord's suggestion to use human excrement to cook some bread he was to eat as a symbolic parable about the siege of Jerusalem. He was allowed to use cow manure instead (Ezekiel 4:9-15).

The desire amongst the Jews for ceremonial cleanliness was still very much alive in the time of Jesus, as explained by Mark 6:3-4. Although this washing of hands before eating was done for ceremonial reasons, it would also have helped prevent the spread of diseases.

To think about and discuss...

1 Paul teaches us that the body of each Christian is a 'temple of the Holy Spirit' (1 Corinthians 6:19). He assumes in Ephesians 5:29 that we care for our bodies. Do our sanitation practices and personal hygiene show that we care for our bodies – or might our way of life be making us (or our communities) sick?

2 Jesus says that the second greatest commandment is to 'love your neighbour as yourself' (Matthew 22:39). Are we causing others to suffer illness because of poor sanitation and hygiene in and around our homes?

3 Luke, a doctor (Colossians 4:14), records in his gospel how Jesus sent out disciples to, amongst other things, heal the sick (Luke 9:2 and 10:9). Can we therefore consider that any work we do to prevent other people becoming ill is pleasing to God?

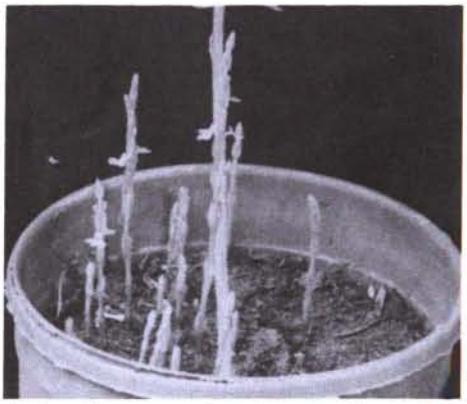
Brian Skinner has worked in Uganda for a number of years with Water Aid.

Compiled from material by Dr Imuetinyan Igbinnosa and John Wibberley

Striga

(WITCHWEED)

A serious problem for crop farmers...



Striga shoots growing from sorghum plant.

NO FARMER ANYWHERE is without the problem of weeds. They will grow with every crop planted. They are reminders of a fallen world (Genesis 3:17-19). Every farmer struggles to overcome them so crops can grow well. Those who do not work to overcome them will receive a poor harvest (Proverbs 24:30-34).

Weeds take water and plant foods away from our crops. It is therefore much better to weed when the weeds are small, before they do any real damage to crop production. They are easier to kill then, too.

The Bible gives encouragement that they will not always triumph over crops (Isaiah 55:13) and Jesus drew many lessons from them (Matthew 13:1-29 and 36-43).

There is one weed which is particularly damaging to crops. This is called *Striga* or Witchweed. *Striga* does not just take water and plant foods from the soil, it is actually a parasite, growing *on* the roots of crops.

There are about 50 different species of *Striga*. The annual species are the most damaging weeds to the cereal crops, especially in areas with low and unreliable rainfall throughout Africa and Asia.

They include:

- *Striga hermontheca (S senegalensis)* – the most common *Striga* in East, West and North Africa. It can grow up to half a metre in height and carries spikes of pink flowers which produce capsules containing masses of tiny, dark-coloured seeds. It is widespread in maize, millets, upland rice and sugar cane, but most severe in sorghum. It can wipe out an entire sorghum crop but more commonly reduces yields by one-third to one-quarter of their potential.
- *Striga asiatica (S lutea)* has red or white flowers. This species is a problem in India, Southern and Central Africa and the USA.

Many farmers do not realise the danger of *Striga* in their crops. They like the beautiful flowers growing in their crops and may even leave them while removing other weeds.

***Striga* should be seen as a very serious threat to the land. It makes it unsuitable for growing a number of crops, especially sorghum, for many years once the weed builds up. This is because of the huge numbers of seeds left in the soil for so long.**

Areas of low rainfall and poor soil fertility, especially where erosion has removed topsoil and where cereal monoculture has been practised for years, are very suitable for the growth and development of *Striga*.

No single measure is enough to control *Striga* completely but a combination of practices can reduce the problem. These include:

Crop rotation

This is a first priority. Avoid long runs of cereals, especially of the same species. Grow crops which are not affected, or grow those which also stimulate the seeds of *Striga* to germinate so that they can be removed before the next cereal is planted. Such crops include cotton, groundnuts, sunflowers, sesame and the green manure crop, *Crotolaria* (sunnhemp) – also grown for fibre.

Trap crops

Some plant species have been identified by scientists which stimulate *Striga* seeds to germinate, but the parasite is then unable to penetrate the root. Without the supply of food from the plant root, the germinated *Striga* seed dies. Examples of trap plants include various green manure crops such as *Abrus pricatorius*, *Calapogonium* species, *Mucuna flagellipes* and *Pueraria* species. Green manure crops are ploughed in after about 4–6 weeks and greatly improve the fertility of the soil. (See *Footsteps No.7*). Cowpeas, *Vigna unguiculata* and a variety of soyabean, *Glycine max* variety M90, can also be used as trap crops. These plants should be planted in rotation with other cultivated crops to reduce the amount of *Striga* in the soil. They

are a very valuable way of tackling the problem.

Densely planted sorghum species (including the forage type, Sudan grass) will stimulate a flush of *Striga* germination and seedlings can then be ploughed under before flowering. However this nonproductive work and use of land is unattractive to small-holder farmers in dry areas!

Improved soil fertility

Adding composts, manures and fertilisers increases the competitive advantage the crop has over the weed. Nitrogen fertilisers such as urea, can inhibit or reduce the germination, growth and development of *Striga*. Experiments are still going on to find out the quantity of nitrogen needed to increase crop yields while at the same time inhibiting the growth of *Striga*. Maize is particularly helped in its battle against *Striga* by receiving extra nitrogen. Irrigated crops also suffer less.

Shallow cultivations

Use a hand hoe (or ox-drawn cultivator) to break up the surface of the soil between the rows of crops. But beware – unless repeated, such treatments can actually encourage more shoots to grow from damaged *Striga* plants.

Hand pulling

The complete removal and burning of *Striga* shoots before they can flower and reseed is the best way for the average small-holder farmer to control *Striga* – but beware! Unless repeated several times through the season it can encourage the weed to produce more new shoots if pulling is only an occasional and half-hearted effort.

Stubble cultivations and burial

These prevent post-harvest flowering of *Striga* by early ploughing under of the stubble of affected crops.

Resistant varieties

Much research has been devoted to finding resistant or tolerant varieties for such crops as sorghum, cowpea,

maize and millet. These resistant varieties suffer less damage from *Striga*. For example, in East Africa, the Dobbs types and Serena sorghums have some resistance. Farmers are advised to seek the latest local information on suitable varieties. Seeds of these resistant varieties can be obtained from research centres such as…

International Institute of Tropical Agriculture (IITA)
PO Box 5320, Ibadan, Nigeria

IITA/SARFGRAD Project
Ouagadougou, Burkina Faso

ICRISAT
Patancheru
PO Andhra Pradesh 502324, India.

Chemicals

Herbicides have also been developed, but the cost of these generally makes their use unsuitable for the average small-holder farmer. Expert advice should be sought before attempting to control *Striga* in this way. Various chemicals (strigol, ethylene and cytokinins) have been found to encourage the germination of *Striga* seeds. Without a crop root to penetrate, the seedlings quickly die.

***Striga* is a serious threat to food production. Once it has become established, it is very hard to remove completely. Only persistent, hard work can overcome this terrible, parasitic weed. Make sure all farmers in your area are aware of this problem. Please write in and tell us your experience with this difficult weed.**

Dr Imuetinyan Igbinnosa is a scientist working for the Maize Research Programme at the International Institute of Tropical Agriculture, Ibadan, Nigeria.

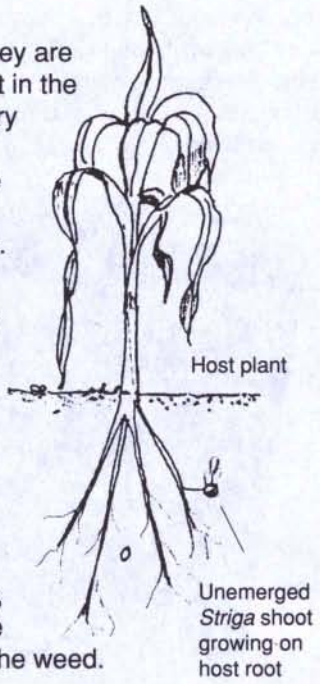
John Wibberley is with the team of World Mission Associates (WMA) and is a Visiting Fellow at the Royal Agricultural College.

Why is *Striga* such a problem?

Striga spreads by seeds. These are very tiny, they are produced in great quantities and can lie dormant in the soil for many years (at least ten), especially in dry soils. The seeds only germinate when near the roots of crops on which *Striga* likes to grow. The seeds produce tubes (haustoria) which grow into the crop root, taking out water and nutrients.

The weed seedling often stays below ground from over a month, during which time it is totally parasitic on the crop and so does considerable damage before the farmer even sees the weed. Later it will produce small, hairy, green leaves which can produce some of its own food, making it a semi-parasite. The shoots can mature within three months to release seeds again.

Affected crops are stunted and their leaves wilt, turn yellow and die early. Crop yields can be significantly lowered even with low numbers of the weed.



Small Scale Sanitation

by R Feachem and A M Cairncross
Ross Institute (54 pages)

A small booklet which is a very useful introduction to a wide variety of sanitation techniques, with many details about small scale systems including pit latrines.

Price £3.50

Rural Water Supplies and Sanitation: Blair Research Bulletin

by Peter Morgan
Macmillan, 1988

This 360 page book brings together the latest information on how to establish and maintain clean water supplies in areas at present lacking sanitation and clean water. It provides a variety of practical and appropriate ideas.

Price £8.99

The Worth of Water: technical briefs on health, water and sanitation

Introduction by John Pickford
ITDG, 1991 ISBN 1-85339-071-2

This 136 page book is made up of all the technical briefs previously published in editions of *Waterlines*, which their readers found so useful.

It brings together 32 technical briefs with details about a whole variety of techniques including sanitation, water supplies, hand-pumps, water sampling and soap making. Each brief includes details of where to find more information. It is an extremely practical and helpful guide for anyone working with water supplies and sanitation.

Price £8.95

The above three books may be found in large bookshops world-wide. If unavailable, they can be ordered from:

IT Publications Ltd
103-105 Southampton Row
London, WC1B 4HH, UK.

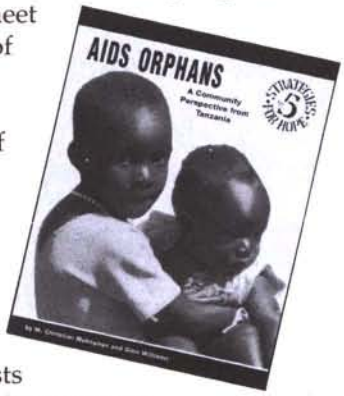
Add 20% of the book price for surface postage and packing. For further details of other books write and ask for a catalogue.

Strategies for Hope

Two new booklets available...

No 4: Meeting AIDS with Compassion
This booklet describes how St Martin's Clinic in Ghana provides care and support to people with AIDS.

No 5: AIDS Orphans
This looks at how AIDS affects the family system, which is the basis of family life in a rural area of Tanzania. It describes how various groups are trying to meet the needs of the rapidly growing numbers of children whose parents have died of AIDS.



Each booklet costs £1.50 including postage and packing. However, organisations in sub-Saharan Africa who are unable to pay in foreign currency may request up to ten copies of each booklet (and also the first three booklets reviewed in *Footsteps No.6*) free of charge. Requests for larger quantities will also be considered.

The booklets will be available in French and Swahili. They are an invaluable help to those working with AIDS.

Write, with a letter explaining your work, to:

TALC
P O Box 49
St Albans, Herts
AL1 4AX, UK.

Flipcharts

This series uses drawings based on the Disney Health Films. The flipcharts are useful in small discussion groups. There are two versions – an African version with script in French/English, and a South American/Asian version with script in Spanish/English. Each flipchart contains up to 27 drawings about the subject with information and questions to encourage discussion with small groups.

What is Disease? – explains what disease is and how it affects people, using the character of a farmer named Charlie.

How Disease Travels – shows how disease travels from person to person, infecting the whole community through water, air and personal contact.

Cleanliness Brings Health – compares a healthy family practising good hygiene with one that is careless in cleanliness and suffering from disease which could be prevented.

Infant Care and Feeding – the importance of good food for mother and baby. How to prepare nutritious foods for a baby.

The Human Body – this describes different parts of the body and their functions. Tells how eating proper foods can help us have healthier bodies.

Each flipchart costs $5 plus $2 for surface postage and packing ($1.50 for additional flip charts). Order from:

World Neighbours
5116 North Portland Avenue
Oklahoma City
OK 73112, USA.

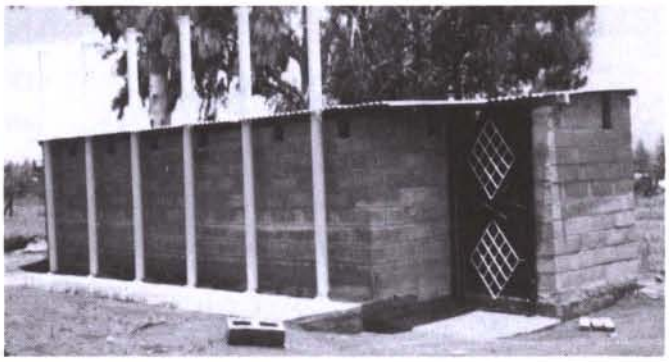
FILMSTRIP...

How to Build, Use and Maintain a Simple Pit Latrine

A young Nepali schoolgirl, Sita, is taught about the importance of using a latrine at school. Sita realises the health benefits sanitation would bring. She encourages her family to build a latrine and explains the steps and materials needed. Afterwards other families in the village begin the simple task of building their own latrines.

The filmstrip is available with a script in English, Spanish or French. Cost: $10 plus $1.50 postage and packing. Order from World Neighbours – address above.

Low Cost Sanitation Work in Lesotho



by Isobel Blackett

IN 1981 the Government of Lesotho made a commitment to improve the water and sanitation in the country. An initial Urban Sanitation Project was started. By 1983 this project, known as the Urban Sanitation Improvement Team (USIT), was well established and a Rural Sanitation Project (RSP) was beginning work, based on some of USIT's experiences.

Who has the responsibility to improve sanitation?

Both USIT and RSP are now well established and successful programmes. Their work covers almost the entire country and a significant improvement has been seen in the sanitation of many households in both rural and urban areas.

The ideas behind both programmes are similar and based on the following:

- Improved health requires a clean water supply, adequate sanitation and good health and hygiene practices.
- Sanitation is the responsibility of the individual householder.
- Adequate sanitation should be seen as being as much part of a house as the door or roof.
- If people pay for their own latrines it means they really want them and will then look after, clean and maintain them properly.
- People require encouragement, education, practical help and assistance to improve their sanitation facilities and hygiene practices.

What encourages people to improve sanitation?

In Lesotho it has been found that people like to build improved latrines for two main reasons:

1 Through health education they have learnt that improved sanitation and hygiene practices are good for their health.

2 An improved latrine adds status to the house and is regarded as modern and attractive. It is also convenient and comfortable to use.

Promotion is carried out over the radio, in schools, churches and clinics; also in community groups, women's organizations and by local chiefs and officials who help USIT and RSP in promoting improved sanitation and hygiene. USIT will work with *anyone* who's interested!

'I'd like a VIP latrine. Please can you help me?'

A client will come into a USIT office, having decided to find out more about Ventilated Improved Pit Latrines (VIPs).

A USIT officer will explain how the VIP works and the best way to get one. The client will be given a material list, cost estimate, plans and help to find a trained builder. The client will be offered a loan for 60% of the cost if they have difficulty in paying for the VIP at once.

A technical officer goes to the person's house and looks at the site. The client is advised on the best place to put the latrine and the way it should face. If the client agrees, the pit site is marked out on the ground and the client then digs out the pit.

The client collects the materials and gets the builder to start work. During this time USIT will supervise construction and check everything is going well.

When the latrine is finished the USIT community staff will visit the client and explain how best to use, clean and maintain their new VIP.

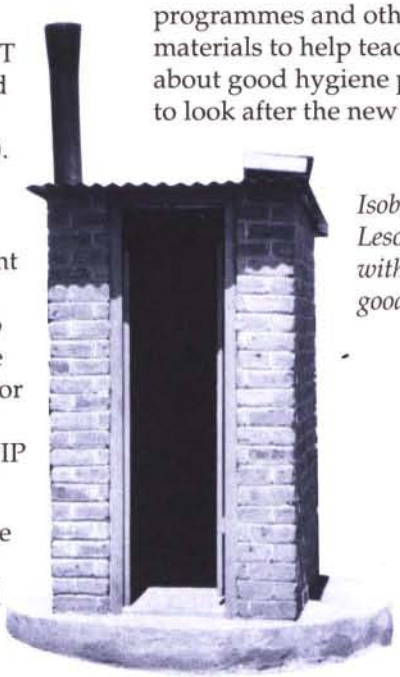
Training local builders

USIT and RSP arrange ten-day builders' training courses for local builders in every town and in the rural areas. These builders would usually build homes and, by training them, latrine building becomes associated with house building and latrines are often built without any input from either of the projects.

Schools

If you visited Lesotho you would see – as in the photo above – long rows of VIPs in primary and high schools all around the country. USIT believes that children need to know about good hygiene and sanitation from an early age. If they learn that sanitation is important, when they grow up and have their own families they won't want to use the bush, a bucket or unimproved latrines.

USIT community staff will come and talk to the teachers and students about cleaning, maintenance and health education. USIT uses tape-slide programmes and other attractive materials to help teach the children about good hygiene practices and how to look after the new VIP latrines.



Isobel Blackett worked in Lesotho for six years with USIT, promoting good sanitation.

Effective Sanitation Projects

by Isobel Blackett

What makes a low-cost sanitation programme successful?

- Are a lot of latrines in the project area enough evidence to prove that success has been achieved?
- Does it matter if the latrines are always used?
- Does everyone use them?
- Are they kept clean?

Let us look at some indications of what *makes* a programme successful and how to *plan* for a successful project.

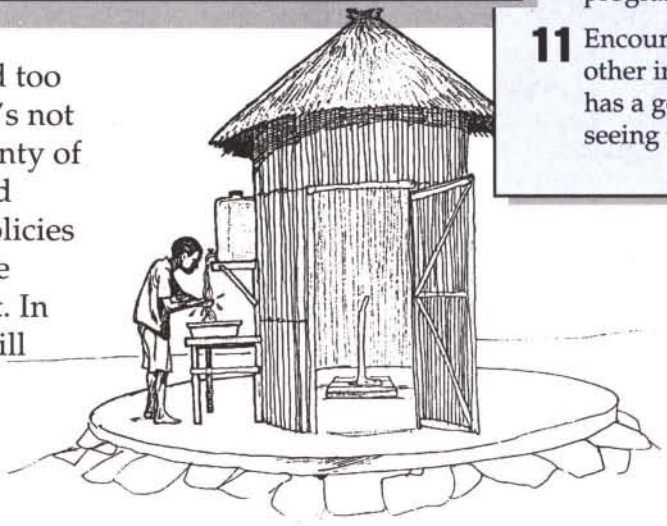
Six points of a successful sanitation programme

1. People in the area really want an improved latrine and are prepared to pay for it or build it themselves.
2. The latrines are properly used by everyone, well cleaned and well maintained.
3. The programme is sustainable and can assist with long-term improvements.
4. Sanitation work is integrated with improved water supplies. The sanitation work is coordinated with water and other forms of sanitation improvements.
5. Education about improved hygiene practices, eg: hand-washing and proper disposal of childrens' faeces, are part of the programme – not an optional extra.
6. Attitudes towards sanitation and hygiene are changing and improving in the area.

Eleven guidelines for planning an improved sanitation programme

1. Aim for a sustainable programme which makes long-term improvements. This will not happen quickly – it may take many years to be achieved.
2. Find an appropriate latrine design for the area. It should be technically able to provide adequate sanitation, affordable for most people and culturally and socially acceptable.
3. Discuss all you are doing and planning with the future users of the sanitation – especially the women and community representatives or leaders. Work *with* people. Don't aim to do the work *for* them.
4. Don't offer to give people latrines or to subsidize them. The desire to achieve rapid results often leads to serious problems. A credit scheme or revolving loan fund may help many people build a latrine while leaving them fully responsible.
5. Promote latrines so that people desire to have one – don't threaten people that they 'must get a latrine or else…'.
6. Use any means possible to promote improved sanitation. Convince community leaders, local officials, teachers, primary and village health workers and encourage them to assist in the promotion work.
7. Either encourage people to build the latrines themselves or privatize the construction of latrines by training local builders.
8. Make sure all latrine construction is backed up with full health and hygiene education and help on how to use and clean the latrine properly.
9. Coordinate the work with those aiming to improve the water supplies or other forms of sanitation.
10. Keep the programme costs as low as possible and keep staff numbers low. This will help the programme keep running for a longer period.
11. Encourage and help schools, churches, clinics and other institutions to improve their sanitation. This has a good demonstration effect on everyone seeing them.

Does this sound too complicated? It's not really! Take plenty of time to plan and discuss your policies and programme before you start. In this way you will encourage a successful programme of sanitation.



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