Paper No. 142

Sanitation and drainage in rural areas of Pakistan

By

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Introduction

Pakistan, like other development countries has been lagging behind in providing basic aminities of clean water and sanitation to the majority of its people. This is primarily due to the financial limitations and institutional, material and skilled manpower constraints. At present out of a total population of 83.7 millions only 34% is being served with water supply whereas sanitation facilities are available to 13% only. There also exists a wide disparity in the availability of these facilities between the urban and rural areas. In urban areas potable water is available to 72% and sanitation to 42% of the population whereas in rural areas access to clean water is available to 23% only and sanitation facilities to only 1.78%.

This paper presents and discusses the santiation and drainage problems of the rural areas of Pakistan with a view to recommend guide lines for a better and healthier rural environment.

Existing Situation

The rural community has typical way of living though it varies from area to area and from tribe to tribe. The awareness to sanitation, in general, is lacking in rural areas. The absence of proper sanitation facilities causes wide spread environmental pollution and add to aggravate the living corditions. Due to sub tropical climate heat and humidity create ideal conditions for pathogens survival. In rural areas the insanitary conditions and improper disposal of wastewater present an extremely unhygienic situation. The open disposal of human excreta and animal dung and spreading of sullage water cause severe threat to the community health.

The unhygienic disposal of wastes has many ill effects. Human excreta constitutes the principal vehical for the transmission and spread of a wide range of communicable diseases. Some of these diseases rank among the chief causes of sickness and death in rural communities where poverty and malnutrition are ubi-

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quitous. Diarrheea, respiratory disease and endemic malaria are the main cause of death amongst small children and infants in rural areas. Cholera is responsible for numerous deaths in every age groups, although under endemic conditions it is the children who suffer the most fatalities. Other diseases such 25 bookwear infections and such istosomiasis produce chronic debilitating conditions which impair the quality of life and make individuals more vulnerable to super-imposed acute infections.

The proper collection and efficient disposal of human excreta is of much importance in rural communities because of the peoples habit of defecation in the open fields and making use of human excreta in agriculture. Such re-use system has a positive role in supporting economic activity and food production and is often cheaper than alternative methods of disposal. However, it presents challange for designing and developing technologies that will not pose unacceptable risks to health. Presently in most of the villages in Punjab and Sind the sullager water in absence of proper drains stagnates in kacha streets and ultimately reaches the village "Chapper". These cesspools of dirty water are the breeding places for the insect vectors of malaria, filariasis and other diseases. The number of people effected only by the malaria during monsoon is exceptionally large and hence remidial measures are essential. In rural areas there is no proper arrangement of animal dung collection and disposal. Sweeping of houses and cattle sheds are generally dumped in open at the out skirts of the villages and subsequently used as a manure. This sort of dumping of refuses results in environmental problems particularly in the wet seasson. Thus the situation demands immediate scientific solution of the problem acceptable to the rural communities.

National Sanitation Programme

Realizing the need of better environment in the rural communities where majority of our people lives, the government of Pakistan accorded top priority to this basic need of the people in the 6th Five Years Plan. This priority was in accor-

dance with the aims and objectives of the International Drinking Water Supply and Sanitation Decade 1981-90 launched by the United Nations. Further to provide momentum to the programme a National Conference on Drinking Water Supply and Sanitation was held in Islamabad on 16-19 November 1981. The expert Group after deliberations in the conference recommended that top priority in resource allocation should be given to rural water supply and sanitation programme. It has been envisaged by the Planning and Development Division to increase rural santiation coverage from 2 to 13% of the population by 1990 thus benefitting an additional population of 8.72 million at a cost of Rs. 872 million. The system proposed in the public sector involves simple open drains for conveying the liquid wastes away from the communities for which unit cost of Rs. 100/- per capita has been assumed. Further details are given in Annexure-I.

Socio Economic Conditions

The literacy level in the rural area is very low as compared to urban areas. The people are ignorant about the requirements and maintenance of a healthy environment. They prefer defecation in the open fields and this habit of the people is difficult to change without education. They consider it more hygienic to dispose off excreta in the open fields.

It may be also due to economic consideration of manual collection and space limitation as most of the houses in the villages do not have place for construction of any type of laterine. It is also generally believed that dry pit latrine is more unhygienic in the smaller houses.

The open field defecation is liable to create health hazard particularly in rainy season when dry places are rarely available in the open fields and people use to release of themselves on the berms of fields. In such conditions the persons going out in the fields are suspectible to bacterial infections. Repercussions of ill health of villagers may be equally grave at the national level as farmers, village craftsman,

agricultural class contribute quite a sizeable share to the development of the country.

Options for Sanitation

Human Excreta Disposal

As mentioned earlier the practice of the most of the people used to go out in the open fields for defecation has been quite old and it would require a lot of efforts to change it. Nevertheless, the following methods are suggested for excreta disposal in rural areas.

Pit Latrine

The pit latrine remains to date one of the most suitable technology for excreta disposal in the tropics. It represents the first rung of the sanitation ladder but inspite of its apparent simplicity the adoption of this technology has met with mixed success. Due to misuse and inadequate maintenance pit latrines have the problem of odour, flies, and uncleanliness and the fact is that the open pit latrine, private as well as communal, are often unpleasant and unhealthy places. Generally the health and aesthetic problems of pit latrines are due to the open nature of the pit allowing free access to flies and mosquitoes which can transmit diseases. In addition the open pit permits odours to enter the privy enclosure.

The 'Dry' pit privy, which receives only faeces and urine can become 'wet' through the addition of water used for anal cleaning or from squatter plate washings entering the pit, or by the pit being dug below the groundwater table. The two major disadvantages of wet pits are the tremendous increase in fly and mosquito breeding caused by excessive water in the pit and the possibility of infiltration of contaminated water into the surrounding soil. The contaminated sub-soil water is drawn through hand pumps and is consumed by the villagers which effect their health very adversely.

Early investigations have shown in the presence of water faecal coliform could travel upto a distance of 10 m from the pit, whereas, coliforms from a dry pit in sandy soil contaminated a distance around the pit of only 30 cm. Also increased moisture in the wet pit enhances decomposition of the excreta.

When designing the pit latrine consideration must be given to such factors as water-use practices, sub soil characteristics, population densities and location of the nearest water supply dug-well. Trade-offs between reduced storage volume of the wet pit have to be made against its potential for contaminating the ground water supplies.

The rate of filling of a pit depends upon the number of people using it, the material used for anal cleaning, the level of the water table and the nature of the soil. As a rough guide the accumulation of solids in a dry pit can be taken as 40 lpa where water is used for anal cleaning. A pit one metre in diameter and three metres deep therefore, lasts a family of six about five years. The accumulation of solids has been found to be as shown.

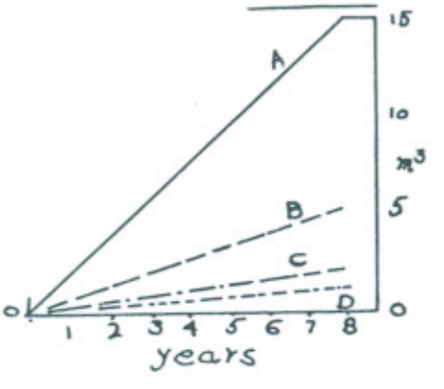
Solid accumulation

A human waste from family of five (1 1/pd)

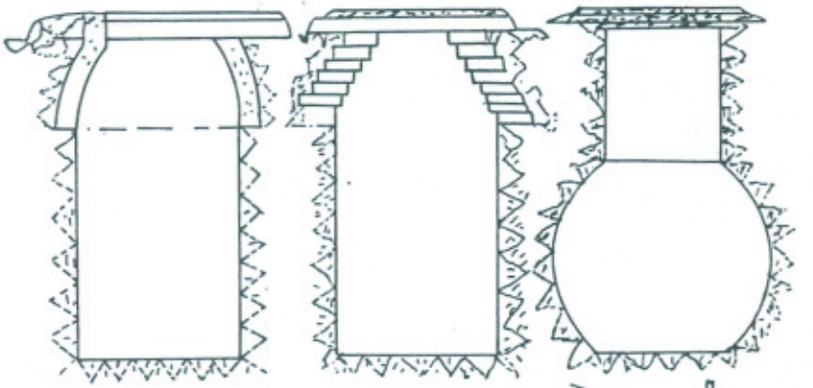
B solid waste alone

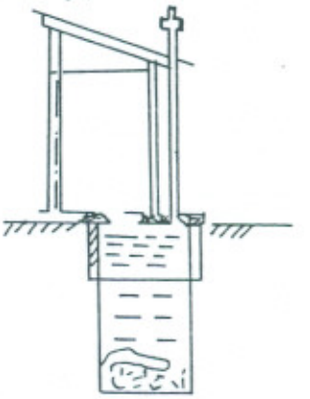
C accumulation in dry pit

D accumulation in wet pit



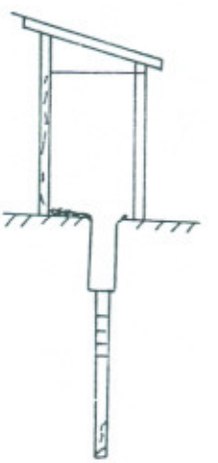
In suitable soils pits may be much larger and may then last up to twenty years. Some methods of enlarging the pit are shown here.





Ventilated pits

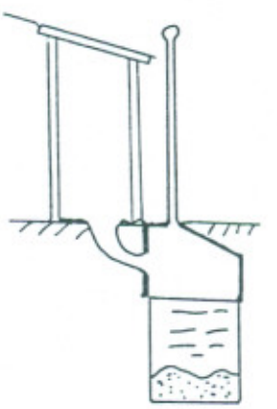
If the superstructure is slightly offset from the pit a pipe can be provided for ventilation. Up-draught will be increased if the pipe is painted black and placed on the sunny side of the building. A 150 mm pipe with a wire guaze cap has been found to trap flies who are attracted upwards by the light.



Borehole latrines

When soil is firm and free from rocks or boulders a borehole up to half a metre diameter can be bored and used as a pit. Depths upto ten meters are common, but even so a borehole soon fills.

Boreholes should always be lined for the top meter or so, and may be lined throughout their depth. Bamboo is often used for lining. Apart from their short life-span, boreholes easily become fouled near the top and are therefore liable to be infested with flies.



- incident solar radiation
- water temperature
- toxic inhibition
- wind induced mixing

Stabilization ponds are important and effective method of sullage treatment in hot temperate climate. These ponds are inexpensive and are more efficient in destroying the pathogenic bacteria.

Stabilization Ponds

In view of this it is considered as an appropriate method of waste water treatment for Pakistan because of low cost and easier maintenance. The effluent from these ponds may be used for agricultural purposes. With effluent it is advisable to grow non-food crops such as fodder sugarcane etc. It is suggested that the conventional village pond be given proper shape and design depth for its conversion to stabilization pond. Stabilization ponds have given very encouraging results of waste-water treatment.

Aqua-culture

It is a new technique for re-using human waste, either by fertilization of fish ponds with fresh night soil or by rearing fish in oxidation ponds. This technique is still in experimental stage. No research on this method has been done in Pakistan. So it is too early to recommend it for use in our rural areas. The human wastes are also successfully used for algee production in many countries. It is a source of protien, which can be used as animal feed.

Bio-gas Production

The an aerobic decomposition of human excreta and animal waste produces

combustible gas, methane, Bio-gas plant or cowdung plants are being introduced in Pakistan. The most common uses for the gas are for domestic cooking and lighting, though it can also be used to power combustion engines if produced in abundance. It is important to point out that the addition of night soil, high in nitrogen, to cowdung results in higher yields of gas. The bio-gas plants are getting popular with rural communities. The technology is now readily available in the villages. The bio-gas plants are becoming popular in rural communities.

Composting

Composting has been definel as "a biological process for converting organic solid wastes into stable, human like product whose chief use is as a soil conditioner. Composting has long been a traditional method for the recycling of farm wastes and more recently it has been used for treatment of night soil and sewage sludge. In rural areas of Pakistan composting is conventionally used for digistion of animal excreta and sweeping of houses and cattle sheds. The system is good but needs basic improvement in the construction of pit. The pit should be dug in open field at a reasonable distance from the village. The pit, when about to fill with solid wastes should be covered with earth for anaerobic composting for about 12-18 months. The alternate pit should be used during this period till the digisted stuff is used as manure.

Community Education & Participation

The illitrate people in the rural communities due to ignorance do not always appreciate the benefits they can derive from wate supply and sanitation; this is an obstacle to their participation in the planning, operation and maintenance of facilities. Education through hool and other media should be undertaken before the facilities are installed. Such education should also cover the appropriate use of the facilities.

Massive efforts should be mobilized to encourage and motivate communities

by a carefully planned use of communication media which should be a permanent feature of training and support programme for community participation and health education. Communication media should utilize the community leaders including Masjid Imam. They in turn should be given short orientation course which should emphasize the relationship between safe water, good sanitation, food hygiene, adequate nutrition levels and health. Cultural and regional aspects for each community should be given utmost importance. The 'Holy Quran' has emphatically mentioned for self cleanliness and of living environment by the Muslims. The primary education must have a well planned curriculam on health and sanitation, to create awareness in the young generation of the rural areas.

Recommendations

The following recommendations are made for achieving the objective under specific situation keeping in view the financial, economical, manpower and material resources of the country as well as the social and cultural habits of the people :—

1. The rural sanitation should be accorded top priority at the national planning process.

2. Open pucca drains be constructed.

3. Katcha streets should be brick paved.

4. The village ponds should be converted into stabilization ponds and where pond is used for bathing and washing it may be sagrigated from human excreta disposal pond.

5. Individual house holders should be encouraged to provide flush latrine with mini septic tank. For this purpose financial help may be given from Zakat and Usher in shape of material.

6. Aqua-privies and septic tanks may be constructed in schools and near mosques for demonstration purpose.

7. Community latrines and community septic tanks be introduced where it is possible topographically and socio economically.

8. Village elders and Imams be involved in health and sanitation programme for educating the people.

9. The Government, through local government should provide technical know how for construction of such facilities to the rural community.

10. Sites for dumping human excreta and cow dung be specifically marked and the rural population be educated to dump the wastes properly.

11. Bio gas plants be introduced for the general development of the rural area and to create better health environment.

12. Modren media be used for the education of the rural population.

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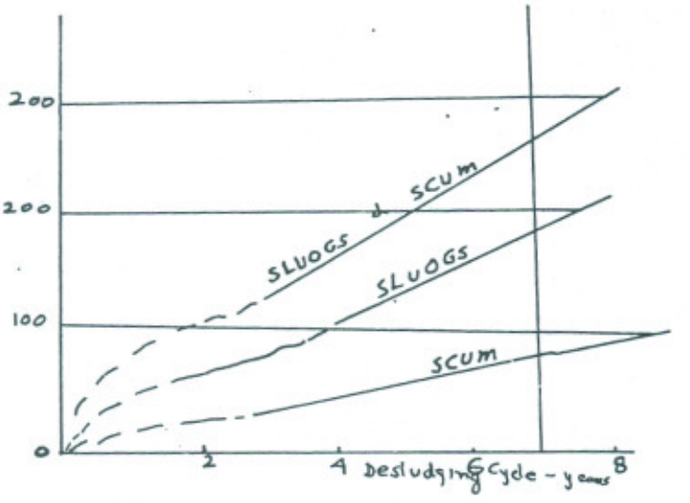
The Reed's Odourless Earth Closet has a pit displaced form the superstructure and connected to it by a curved chute. A large pit gives long life, and a ventilating pipe is provided. Advantages claimed include the reduced danger of children falling in the pit and the pit contents being out of sight. However the chute becomes fouled and attracts flies; a brush may be provided to clean the chute but this in turn is a health danger.

Vaults

One method for preventing soil pollution and ground water contamination is to line the pit with a water tight material and it turn it into a vault. When the vault is filled up the contents may be removed by dipper and bucket, and when fluid by vaccum trucks.

Septic tanks

The septic tank which has found very wide application consists of a compartmentalized vault within which settlement and some liquefaction of the solids takes place, and a subterranean tile or leaching field where most of the biological treatment of two saptic tank effluent occurs. All the household wastewater goes into the septic tank in addition to the excreta and flushing water. The cost of septic tank as well as need for periodic desludging makes it inappropirate for rural population. Community septic tanks can also be designed provided the people have knowledge to use it properly. The desludging cycle over time lapse has been shown in Fig. against sludge and scum accumulation liters person.



Pour flush latrine

Pour flush latrines are good where water is used for anal cleaning and where there is sufficient water for flushing. This type of latrine connected with a small septic tank is most suited to a medium size family. However, the following precautions are essential to be observed :—

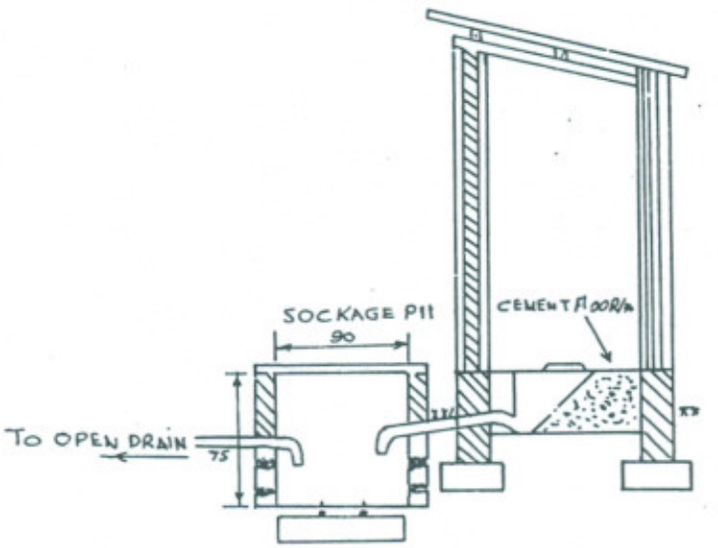
a. The effluent from septic tank may be disposed in a near by drain leading to "Chapper" or

b. The effluent be allowed to enter in soakage pits.

c. There shall be no hand pump or percolation well within a radius of 100 feet from the soakage pits.

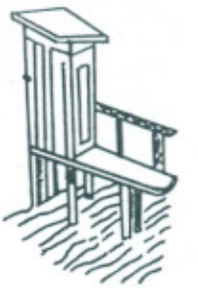
d. Only one water closet be connected to septic tank and the flushing shall be done with on 'lota' water instead of conventional flushing by means of two gallons cistern. Though the septic action/treatment of the effluent is never complete, yet the system is suitable and economical for the rural areas. This mini septic tank unit will suit 'Purda' observing families and those who can afford to incure expenditure on such a unit.

This arrangement has successfully been tried in many houses in some villages for the last 15 years without any problem. The effluent has been disposed off through drain to the village pond.



Overhung latrines

In these excreta falls directly (or down a chute) into running water or the sea. If there is a plentiful and perennial flow and water is only used a sufficient distance downstream to ensure self-purification, overhung latrines may be satisfactory. Such type of latrines have been used in Swat area of N.W.F.P.



Night Soil Collection (Bucket system)

The manual collection and removal of night soil has been practiced for a long time in rural areas. The excreta is directly deposited in container that is daily removed by scavengers. It has the advan tage of minimum out-lay on the part of the user but it is very unhygienic and an environmental health hazard. The limitations to the bucket latrine include the frequent collection visits required to empty the night soil as well as difficulty of preventing flies and odours from the bucket. This method

of disposal used widely in Pakistan is highly unsatisfactory and inhuman because a separate class of society is assigned to this unpleasant duty. With the awakeness in the society this system is becoming unpopular. The night soil collected by bucket or cart must be disposes off hygienically. The most primitive and least satisfactory technique is burial in the ground which is not only offensive but may expose the fresh excreta to flies and surface runoff.

Various excreta disposal system as discussed do not include the household wastewater usually referred to as sullage water. In the rural areas sullage water is simply disposed off on the streets and allowed to soak into the ground. Where soil is hard, as in northern parts of Punjab the sullage water accumulates in the low lying areas or stagnates in the streets. In the plans of Punjab and Sind where sub soil water is very high the seepage of sullage water into ground is also very poor and streets sometimes turn into cesspools. It is suggested that open drains be constructed for collection of sullage water. These drains invariably be connected to the existing pond of the village. In fact the ponds or 'Chapper' in the villages are presently functioning as stabilization ponds.

Further for improvement of overall sanitation, brick soling in street be provided. This facility, where provided so far, has changed the shape of the village.

Concept of Waste Stabilization Pond Treatment

Waste stabilization ponds are relatively shallow man-made basins in which organic matter is oxidised or reduced, and pathogenic organisims destroyed by the action of naturally occuring biological degradation phenomena. The performance and character of a pond is governed by such factors as:

- depth
- area
- incoming pollution load

ANNEXURE - 1

RURAL SANITATION

(All figures in Million)

	Province/Area	Population 1980	Population 1990	Population coverage in 1980		Proposed population coverage in 1990		Additional population to be covered by 1990	Finances required for covering the additional population by 1990 (Rs.)
				Population	%	Population	%		
1.	Punjab	33.66	41.85	0.67	2	5.67	14	5.00	500
2.	Sind	9.92	12.33	0.09	1	1.89	15	1.80	180
3.	N.W.F.P.	8.46	10.32	–	–	1.03	10	1.03	103
4.	Baluchistan	2.39	2.97	–	–	0.29	10	0.29	29
5.	Azad Kashmir	1.69	2.10	–	–	0.16	8	0.16	16
6.	Northern Areas	0.45	0.55	–	–	0.06	11	0.06	6
7.	Federally Administered Tribal Area (FATA)	2.91	3.62	–	–	0.36	10	0.36	36
8.	Federal Capital Areas	0.14	0.19	–	–	0.02	10	0.02	2
	Total	59.62	73.93	0.76	1.3	9.48	12.80	8.72	872

Unit rates adopted for working out the financial requirements.

1. Rs. 100 per capita for all the areas. Simple open surface drains.

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