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Strategies for Augmenting Rural Sanitation and Drinking Water supply - Impact on environment, health, and women's awareness.

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Abstract : Rural areas in general have poor facilities for liquid and solid waste disposal, and safe drinking water supply. This contributes to the heavy burden of morbidity and mortality. The Dangoria Charitable Trust has tried to improve the sanitary conditions, particularly removal of stagnant waste water emerging from households, in two villages of the Narsapur Mandal in Medak District of the South Indian state of A.P., through application of a double soakage pit, waste water disposal system. The design was a modification of a structure developed by the Central Building Research Institute, C.S.I.R. to suit the local resources and conditions. The project was part of the Department of Science and Technology (DST)-supported coordinated project on water, health and sanitation. Within the village, locations having perennial stagnation of wastewater from households due to lack of suitable drainage were identified. Individual and where possible common structures for two households were constructed. The latter ran in to problems, due to lack of cooperation between the women stakeholders who were trained to own and maintain the structures. Knowledge Attitude and Practice (KAP) surveys done on women stakeholders, before initiating the project and after two years revealed satisfaction with the technology, though many would have initially preferred to divert the water to a common open drain. Women's knowledge regarding link between water-borne and other infectious diseases and degraded sanitation also improved markedly. Household morbidity survey showed *reduction in diarrhoeal and other infectious morbidities.* The structures work well even in heavy monsoon, except in couple of locations where there is black soil. The model is recommended for rural areas with appropriate soil quality. The other components of the project were, improvement in drinking water supply through repair and maintenance of bore wells by trained women mechanics, construction of individual latrines, provision of solid waste disposal bins, school sanitation (latrines and bore well) and demonstration of rainwater harvesting structure.

Key Words: Rural sanitation, health, drinking water, environment impact

1. Introduction

In most villages sanitary conditions are very bad. Household wastewater is allowed to flow in an open area or diverted to an open drain, which sometimes leads into a farm but is often blocked due to poor maintenance. The users fail to accept the responsibility of cleaning this public facility and wait for the `Panchayat' cleaner's (`safaiwallah's) irregular visit. Few if any households have toilets. While organic waste is used for composting, non-compostable materials like plastic, paper and glass, litter the environment.

The Science and Society programme of the Department of Science and Technology (DST), Government of India, initiated a coordinated, multi-centric project to develop models for rural water health and sanitation in which women would be the stake holders and own and maintain the structures. The Dangoria Charitable trust identified two villages –Avancha and Ramchandrapur, in the Narsapur mandal of Medak district in the South Indian state of Andhra Paradesh where there was perennial problem of wastewater stagnation. Women were most affected by this problem since they had to drain the stagnant water manually. School sanitation, and use of toilets also did not exist. To address these problems, effort was made to develop an alternative method of wastewater disposal other than the conventional open drain, which does not serve all the households. The experience with the dual soakage pit technology of CSIR (1,2) with some modifications, as well as provision of other amenities is being shared.

2. Wastewater Disposal Through Soakage Pits

The system includes a household platform for cleaning operations, with a `nani trap' and water seal; a semi partitioned cement tub with lid to remove silt and solid waste and a soakage pit with a lid. The wastewater from the households is diverted through the nani trap, to the semi- partitioned tub – 1.5' deep and 1.5'diameter, made of pre-cast cement concrete ring with a central partition leaving 4" from the bottom (figure 1) for the water to flow from one compartment to the other. The inlet side of the tub is empty, whereas the outlet side has graded metal. The filter tub captures the heavy sediments allowing

colloidal and greasy material to flow with the wastewater into the soakage pit. The soakage pit is 4’ to 6’ deep and 3’ to 4’ in diameter. It is filled with graded metal and sand and is lined at the top with one or two cement rings 1’ height to prevent the walls of the pit from collapsing. It is covered with a cement lid.

Between the two villages, 37 structures were constructed. Initially, a common structure (tub and pit) between two households was provided in some locations to save on cost, but later most households had to be given separate structures due to lack of understanding and cooperation between the two households for, maintenance work.

The beneficiary households provided the labour for digging the pits, and some materials like sand and bricks for constructing the washing platform.

Maintenance of the structure

Women are the stakeholders and charged with the responsibility of cleaning the nani trap daily and the partitioned sedimentation tub, at least once a fortnight. The soakage pit is cleaned once in 3-6 months as and when required with the help of the men.

Alternative methods of wastewater disposal

In 22 locations where the households were near the existing open drain, and did not have enough space for the soakage pit structure, pipeline for diverting the wastewater through the nani trap into the open drain was provided. In three households, wastewater was diverted to a homestead garden, after passing it through a nani trap. In one of the villages, Ramchandrapur, the open drain was repaired to make it more effective. Proper cleaning of existing open drains, was insisted upon, and compared to the past, even these drains are being better maintained by the community.

3. Solid Waste Disposal

For the disposal of solid waste, bins made from pre-cast cement concrete rings, 5 per village including one in the school were provided. The community was advised to use it primarily for plastic, glass, metal and paper waste, and use the organic waste for composting. The bins are cleared periodically by the cleaner (`Safaiwallah’), paid by the village `Panchayat’.

4. **Improvement in Drinking Water Supply**

Training women as hand pump repair mechanics

Since timely repair of hand pumps is a problem in villages, seven women from the villages were trained for a period of one month, in repair of hand pumps. Out of these only two women are currently functioning as paid mechanics and have repaired over 25 pumps over a period of two years. They have also started going to other villages for doing the repair work.

Improved facilities for the hand operated bore wells.

For some hand pumps, platforms were constructed to improve the environment.

On request from the villagers of Ramachandrapur, one water tank with 4 taps was constructed for a hand pump fitted with a motor. The motor and labour were contributed by the community.

Water testing and remedial measures

All the drinking water sources were tested at the State Institute of Preventive Medicine, for chemical and microbial contamination. In village Avancha water from the overhead tank connected to a deep bore well, and supplied through taps, was found to be contaminated. The contamination was traced to a broken pipe. The Panchayat was made to repair the pipe. In Ramachandrapur, water from one of the hand pump operated bore wells near the open drain was found to be contaminated due to damage to the drain and stagnation of water. The drain was repaired with labour given by the community.

5. School Sanitation

In both the villages a set of 2 (Ramchandrapur) and 3 (Avancha) latrines – 2 pit type with a water seal, were constructed to get the children habituated to the use of latrines. Instead of bricks, locally available cement rings (3’ diameter, 3 rings per pit) were used for lining the pits. In addition a hand pump- operated bore well was also provided for augmenting drinking water. Sites for drilling the bore wells were determined with the help of a professional geologist. Soakage pits for recharging the ground water with the spill water

from the bore well were provided, but in the village Ramachandrapur, this did not work effectively due to excess load, and the spill water had to be diverted to a near by field.

6. Roof-top Rain Water Harvesting.

A model structure for harvesting roof water developed by the Mitraniketan, Vellanad, Thiruvantapuiram, Kerala, was also set up in both the schools.

7. Household Latrines

For 13 households, individual latrines were constructed, using a modification of the UNICEF 2-pit latrines model. As mentioned earlier, instead of bricks, cement rings were used to line the pits. Also the super structure was constructed using 4' diameter cement rings with a cutting for the door. This unit costs Rs.2600 for materials and transport Out of this Rs 2000 was given as subsidy and remaining amount, besides labour was beneficiary contribution. Some households preferred to make their own arrangements for a cheaper door and paid only Rs 300/-. During the same period 113 households constructed latrines using the government scheme for subsidised toilets. Community toilets are not acceptable.

8. Awareness in the Community and Training of Women Stake Holders

Before initiating the project, discussions were held with the community, particularly the households who faced the problem to elicit their interest in improving the environment and suggestions for the method to be used. There was overall desire to do something but the community could suggest only the traditional open drains, which would remove the problem from their neighbourhood but transfer it elsewhere if the drains are not maintained. However, after the soakage pit model was explained to the community, particularly the women, by holding focussed group discussions, as well as discussions with members of individual households, the model was accepted. Contractors engaged for the construction of open drains had vested interest, and did their bit to scare the community about the new method. Hands- on training for maintenance of the structures was provided to the women in the presence of men so that though the major stakeholders were women, men can also help with more heavy tasks.

Slide and sound shows on issues related to Water, Health and Sanitation were also shown in the evenings.

9. Impact Evaluation

Knowledge Attitude and Practice (KAP) Survey.

Since one of the objectives of the project was to create awareness in the community regarding water, health and sanitation, KAP surveys were done on 59 women stakeholder, before initiating the project and at the end.

Morbidity survey

Monthly diarrhoeal morbidity survey was done during the second year of the project (November 2002- November 2003) on 180 households who were willing to cooperate and maintain records, using a health card. All age people were included in this survey. In addition, morbidity survey during the first week of the three monsoon months of July, August and September in 2003 and 2004 was done on all preschool children, by making home visits and eliciting information on morbidity (diarrhoeas, respiratory infections and scabies) during the previous 15 days.

10. Results and Discussion

Impact assessment was done for the process as well as the outcome.

Wastewater disposal: Though the cooperation from the community, particularly the women was good, inability to set-up common wastewater disposal structures due to lack of understanding between the beneficiary households was a matter of disappointment. While the community gave labour without hesitation, getting monitory contribution, even after agreeing to do so, was difficult. However, the community was made to contribute some material besides labour as mentioned earlier. Also in the few instances where the initially planned joint waste disposal structures had to be separated, the families were persuaded to make cash or kind contribution towards the additional cost. KAP survey showed that while initially only 6.8% women stakeholders said they were satisfied with the existing system of wastewater disposal, at the end of the project, 100% were satisfied (Table 1). The soakage pit structures in conjunction with the other methods of wastewater

disposal have made a remarkable impact on the environment by clearing the stagnant water, which apart from causing nuisance and inconvenience, was the breeding place for flies and mosquitoes. In two places where there is black soil, the soil conditions were improved by filling the surrounding area with absorbent material like sandstone stone dust, brick dust etc.

Solid waste disposal bins : Though the solid waste disposal bins were meant for non-compostable waste, organic waste is also dumped into it, and later removed for composting or burnt. Use of these bins has reduced the problem of littering particularly near the schools, hotels, toddy shops and other shops. People however, tend to depend on the panchayat cleaner (`safaiwallah'), to clear it and make no effort towards its maintenance. This is yet another instance of lack of community spirit in improving the environment. Educational efforts are continuing. Neighbouring villages have approached DCT for extending similar facilities.

Training women in hand pump repair: Initially women hesitated to undergo training as hand pump repair mechanics, the task being perceived as men's job. However, once they agreed they were enthusiastic learners, and went with the trainer mechanic from village to village, where he went for repair, during the training period of one month, and picked up the skill. Five out of the seven women, failed to continue, because one woman became pregnant, one got a job and the other three got busy with their own farm work. Besides, there was no encouragement from the community and work was not given to them. However, two land-less women persisted with some support from DCT and continue to work as a pair. While one of the villages has acquired a set of tools the other has not, and DCT has to give the tools for the repair. The men in the village do not help the women with heavy work like lifting the pipes, (though they do give such help to a male mechanic) and the Trust auto driver has to help them. He helps with transportation, when called to other villages, and the Panchayat of that village pays for the transport. The women complained to the Collector when he visited the village, about delayed payment, and the collector who was very pleased with this approach, gave instructions to his officers to see that the women get the work and are paid.

Rain (roof) water harvesting: Rainwater harvesting model has found no takers for replication at household level, because drinking water availability is not a problem in these villages. As soon as the rainwater tank gets filled, people use up the water and fail to store it for drier period. In one of the villages, the tap gets stolen, and the `panchayat'replaces it after considerable persuasion.

School sanitation: Though the school bore well was meant for the exclusive use of the school, the community uses it, since there is no compound wall, and no bore well facility near by. However, the `panchayat' takes care of the repair. It is a very useful facility, particularly for the school mid-day meal programme. The school latrines are being used.

KAP survey among the women stakeholders

Table 1 shows remarkable improvement in mothers' knowledge of issues related to water health and sanitation.

Morbidity: In the monthly household diarrhoeal morbidity survey done on the 180 households, reduction in the episodes of diarrhoeal diseases was observed. Thus, while the episodes of diarrhoeal diseases in November 2002 (almost a year after initiating the project) were 26, it came down to 2 in November 2003. There was seasonal rise in the episodes of diarrhoeas during monsoon. Thus the episodes of diarrhoeal diseases were 24,15 and 9 respectively during July, August and September 2003.

Results of the morbidity survey in preschool children done during the monsoon months (July, Aigist and September) of 2003 and 2004, are given in table 2. Significant reduction in infective morbidities like diarrhoeal diseases, and respiratory infections and was seen. The prevalence of scabies was low, and further reduction was statistically not significant.

The overall experience with this project is found to be satisfactory and the model worthy of replication.

References

1. Building Research Note (BRN) No. 28, Waste water disposal system for rural areas. Central Building Research Institute, Rurkee, UP

2. Building Research Note (BRN) No 34, Low cost sanitation for rural and urban houses. Central Building Research Institute, Rurkee, UP.

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Table 1 Knowledge Attitude and Practice Survey among women stake holders

(Sample size 59).

Response	Initial %	Final %
Stagnant water gives bad smell	20.3	100
Stagnant dirty water causes - Diarrhoea	35.6	62.7
Malaria	62.7	100.0
Mosquitoes cause malaria	74.6	94.9
Malaria can be prevented by - removal of stagnant water.	59.6	98.3
Diarrhoea is caused by - contamination of food and water	45.7	98.3
Diarrhoea prevented by - use of latrines	10.2	35.6
good sanitary conditions	16.3	81.3
healthy food	2.0	59.3
Worm infestation is caused by - eating mud and pencils (paica)	39.0	98.3
eating with dirty hands	3.4	11,9
Worm infestation can be prevented by- not defecating in open	5.7	30.5
washing hands after defecation	11.4	84.7
avoiding playing in dust and dirt	36.0	61.0
cutting nails regularly	11.4	77.9
Plastic carry bags are harmful	28.8	94.9
Method of waste water disposal for home- let out in open space	74.6	0.0
divert to open drain	25.4	61.0
divert to soakage pit	0.0.	32.2
divert to kitchen garden	0.0	6.8
Satisfied with method of waste water disposal –yes	6.8	100.0
Method for household solid waste disposal-throw in an open place	57.6	3.4
use the waste-disposal bin	0.00	84.7
Use of home latrine	6.8	32.2

Table 2 ***Prevalence of Morbidity in Preschool Children***

Percentage of children who suffered during previous 15 days

Type of morbidity	***July***		***August***		***September***		***Overall***	
Year	*2003*	*2004*	*2003*	*2004*	*2003*	*2004*	*2003*	*2004*
Sample (n)	*120*	*120*	*119*	*119*	*120*	*119*	*359*	*358*
Diarrhoeal diseases	*14.2*	*5.0 **	*9.2*	*0.8 **	*5.8*	*2.5*	*9.7*	*2.8**
Respiratory infections	*21.7*	*5.8 **	*20.2*	*9.2 **	*19.8*	*1.7 **	*19.8*	*3.9 **
Scabies	*0*	*0.8*	*2.5*	*0*	*0*	*0*	*0.8*	*0.3*

*Proportion t-test ** P<0.01 compared to the year 2003*