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PERCEPTIONS ON ECOLOGICAL SANITATION IN ZIMBABWE: THE CASE OF MASIYARWA COMMUNAL AREA IN ZVIMBA DISTRICT OF MASHONALAND WEST PROVINCE

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ABSTRACT

Ecological sanitation technologies have taken prominence as sustainable ways of managing human waste in communal settings. Since the introduction and adoption of such technologies in Zimbabwe there has been limited evaluation of residents' perceptions of these technologies. Thus, a Descriptive Survey of residents' perception on Ecological Sanitation Technologies was conducted using a pre-tested questionnaire and key informant interviews with beneficiaries, triangulated with focus group discussions, field observations, and secondary data sources. The cultural background of the beneficiaries was observed to play a critical role in molding their perceptions towards the ecological sanitation technologies (EcoSan). Generally, there was a negative perception towards the use of humanure in leaf, stem, and root crops, with a clear show of disgust at the mention of such a prospect. To achieve high levels of acceptability of the technologies, awareness campaigns should target local community leaders (mainly councilors, chiefs, and kraal heads) as critical vehicles for positive perception development and mobilization of the rest of the community.

Key Terms: perceptions, ecological sanitation, humanure, arborloo, fossa alterna, skyloo, Zimbabwe

INTRODUCTION AND RELATED LITERATURE

Ecological Sanitation (EcoSan) is a safe approach to recovering nutrients from human excreta (faeces and urine) by re-cycling them back into the environment and into productive systems (Esrey, Anderson, Hillers, and Sawyer, 2001). It is perceived as the answer to sustainable management of human excreta with minimum risk of environmental pollution and to human health (Morgan, 2000; Orlando, 2007). Ecological sanitation is a kind of man-nature metabolism system dominated by technological and social behavior, sustained by natural life support systems, and vitalized by ecological processes. It interacts with the human settlement system, waste management system, hygiene and health care system, and agricultural system. Therefore, in keeping up with the dogma of Aladdin's lamp, which states that, 'if we can dream of it, we can invent it,' and also the dogma of the technological imperative which states that "when we invent it, we are required to use it" (Hall, Gibson, McWilliams, and Waller, 1992). Thus, having accepted the two dogmas, we have faith that our technical inventions could solve our ecological problems, and that further technologies can solve the problems created by the technological solution to the previous problems. To gain the correct perception of ecological sanitation, three general principles should be adhered to. That is, sewer avoidance, low cost on-site resource recycling technologies, and that water must be rightly priced (Arikah, 2007).

The *flush-and-discharge* and the *drop-and-store* technology are the two sanitation systems that have been adopted for urban and rural settings, respectively (Wolgast, 1993). Sanitation, in the traditional sense, encompassed the problem of sewerage disposal regarding fresh water as an unlimited resource, with the assumption that at the end of the pipe sewerage is treated and the environment would take care of the discharge from the treatment plant (Applied Research Network, 2007). The *drop-and-store* technology, on the other hand, is ideal for rural areas and includes the various types of pit latrines. Drawbacks include smell, fly breeding, risk of pit collapse, short lifespan, and high risk of ground water contamination (Stenstrom, 1996). The major challenge to sanitation today is to achieve safe and non-polluting sanitation for all its inhabitants (Global Applied Research Network, 2007:6).

Ecological sanitation components are divided into two categories that include non-urine diverting latrines, that is the *arborloo* and the *fossa alterna*; and urine diverting latrines, mainly the *skyloo* (Kufunda Village Arborloo Starter Kit, 2004). The *arborloo* is associated with the slogan "leave the

contents, move the loo," and its Latin name, *arbor*, mean *tree* and *loo* for toilet. The arborloo is built over a one metre deep pit, with a movable slab, pedestal, and superstructure. A 50kg bag of cement produces five slabs and five ring beams. The superstructure can be made of grass, plastic sheets (or corrugated sheets) with no special pedestal requirements (*ibid*). Both urine and faeces accumulate in the pit and when its 80-85 centimetres full, the superstructure, pedestal, and slab are moved to the next pit, the remaining 15-20cm is backfilled with soil. The conversion of excreta to humus takes up to four months, and a tree is planted in the used pit. The arborloo is popular in Kenya and Malawi where it is perceived as the banana toilet, since it is responsible for the evolution of a number of banana plantations.

Fossa alterna, alternating pits (in Latin), is characterized by two shallow pits, partly lined. These pits are permanently sited chambers, with a portable pedestal, slab, and superstructure erected. Both feces and urine accumulate in the shallow pit. When the first chamber is 80-85 centimeters full, the pedestal, slab, and superstructure are moved to the second chamber, and the first chamber is backfilled with soil. For the duration of use of the second chamber, decomposition is facilitated in the first chamber. When the second chamber fills up, contents of the first chamber are emptied, and then the latrine resumes use of the first chamber. The first chamber contents are considered fully matured; the period allowed for decomposition varies from a minimum of six months (for an average family of ten) to a year (for an average family of six). The skyloo, on the other hand, targeted the middle to high-income earners. It is a more permanent structure, requiring 8-10 x 50kg bags of cement for its construction. It functions with two types of pedestals which both divert urine into a pipe that leads into collecting jars outside the latrine. Urine is, thus, diluted and used directly for irrigating crops and vegetables, while feces collect into vaults, which are periodically emptied for off-site composting (Morgan, 2005).

In EcoSan latrines, protozoa and virus populations would naturally decrease since the storage in the latrine vaults for average periods of 6-12 months would kill them, due to time, decomposition, dehydration, increased pH, the presence of other organisms, and competition for nutrients (Backland, 2004). KwaZulu Natal (South Africa) EcoSan beneficiaries revealed varying perceptions as to whether composted human excreta is really free from disease-causing organisms, thus, reducing their acceptance level of the technology (Internet Dialogue on Ecological Sanitation, 2001). Winblad (2000) perceived faeces as harbouring viruses, bacteria, parasitic protozoa, and eelworms in their various types. However, EcoSanRes (2005) perceive urine as being the most valuable component of excreta. The supply of nutrients in urine, particularly nitrogen, can increase the yields of green vegetables and

maize in a spectacular way (EcoSanRes, 2005; Morgan, 2005). High organic matter in faeces aids soil-water retention and improves structure; this has helped subsistence farmers in Mombassa, Kenya who were experiencing low productivity due to poor soils and increased cost of inorganic fertilisers (Resource Centre Network for Water, Sanitation and Environmental Health, 2006).

EcoSan adoption and operation invoke a variety of perceptions across the globe, determined mainly by the cultural beliefs and traditions of the groups of concern (International Water and Sanitation Centre, 2003). In early Chinese history, human excreta were commonly used to make composts. Farmers owned 'outhouses', where they invited visitors to leave behind their 'valuable' excreta. According to Winblad and Kilama (2002), "In 1952 seventy percent (70%) of all human excreta produced in China was collected and used as fertilizer, and increased to ninety percent (90%) by 1956." In Vietnam, it was then common practice to fertilize fields with fresh excreta. People relieved themselves directly onto the fields, which resulted in, complains by health officials and the development of double septic tanks for on the spot composting of excreta. In early Europe, Greek, and Roman societies collected human excreta and used it as fertilizer (Internet Dialogue on Ecological Sanitation, 2001). The Romans realized that urine contained high value nutrients, and collecting it made good business, thus, Emperor Vespasian introduced a 'urine tax' along with the proverb '*pecunia non olet', money does not smell* (Jo Smet and Sugden, 2006).

The Chinese, Japanese, and Vietnamese perceive human excreta as a valuable resource, while in the greater part of Europe they perceive human excreta as an unpleasant dangerous waste product (Winblad and Kilama, 2002; Montague, 1999). Ecological sanitation technologies, thus, have an Asian origin, being first introduced in most communist countries and has since spread to Southern African rural communities (e.g. in Malawi, Mozambique, South Africa, and Zimbabwe) because of its vast space requirements. In particular, the arborloo, which requires wide space to allow for the movement of the toilets on its never-ending, orchard establishment journey. Growing trees on old pit latrine sites is naturally acceptable, since it has been a traditional practice for many years. The Kufundis (Kufunda Village Residents in Ruwa, Zimbabwe) perceive the arborloo as the most economic EcoSan latrine that best suits the majority rural population experiencing high poverty levels.

There are always varied fears and concerns surrounding handling of human excreta (Morgan, 2000). In 90% of the world cultures, people who emptied sanitary buckets and cleaned latrines were perceived as outcasts (EcoSanRes, 2005). Concerns were raised in the Tete Province of

Mozambique about EcoSan beneficiaries' fear of being ridiculed for using excreta as fertilizer, since it was widely perceived as extremely repulsive (Morgan, 2004; Global Applied Research Network, 2003). One farmer aired the concern that if "I eat vegetables grown in my own excreta; it would feel like regurgitating my excreta. I would never bear that" (EcoSanRes, 2005). In Zimbabwe, the general preference was toilets, where feces could not be seen and no further handling by the users was required. The Tanum Residents of Sweden, indicated that the use of composting toilets reduced flash water requirements to zero, saving up to 40,000 gallons per year per household, but they were usually put off by the fear of being ridiculed by the rest of the community (Winblad, 2000). In extreme cases, the Masai people of Kenya believed that evil spirits inhabited the pits of latrines, thus, the resistance by some Kenyan cultures to have household pit latrines (Winblad and Kilama, 2002).

There are however, relaxed perceptions towards urine. Urine has a number of medicinal functions; it is used as a quick remedy for burns and scalds. Urine passed early in the morning could be drunk for blood cleansing purposes and to cure allergic reactions and measles. For people who suffered facial skin disorders, urine can be used as a facial wash and toner. Urine can be used for drying fresh wounds; one could pour their fresh urine over a wound to stop bleeding and speed up the healing process. It was also used as an insecticide for banana weevils (EcoSanRes, 2005). Farmers (Stockholm, Sweden) in the commercial sector were ready to buy ecological sanitation because of the perception that it rewarded them with a free source of fertiliser, increased crop production, cash and convenience, in addition to solving health, sanitation, hygiene and waste problems (Sanitation Connection, 2002).

Anal cleansing materials determine the sanitation facility preferences and are both religious and cultural. Washers use water after excreting, widely practised by the Moslems Religion. The Christian Community are wipers; they use paper, tissue, sticks, mealie cobs, stones, leaves, etc. (Winbland and Kilama, 2002). Consequently, washers are comfortable with pour-flush latrines whilst for wipers pit latrines are ideal. Those who used tissue and soft papers would find the flush toilets ideal. Thus, the washers were bound to resist EcoSan facilities because they pressed a straining demand on their anal cleansing habit. Thus, the Moslem had an unwavering negative perception towards EcoSan Technologies (*ibid*). According to Winblad and Kilama (2002), "The choice of sanitation technology is depended on the following factors; the type of anal cleansing material, the climate of their area, the type of soil in their area, the available space for the sanitation structure, the area's ground water level, available resources (e.g. finance) water supply levels, infrastructure, and finally the skills

available." Sanitation perceptions, therefore, varied from location to location due to the prevalent social and economic environment and traditional practices.

In Zimbabwe, in the rural areas, the pit latrine was the earliest introduction that eliminated random open space defecation. It was upgraded to the improved ventilated pit latrine in the early 1980s by the Blair Research Laboratory, supported by several NGOs - e.g. Swedish International Development Agency (SIDA), Danish International Development Agency (DANIDA), the Department for International Development (DFID), and Save the Children UK (Morgan, 1988). According to the Ecological Sanitation Workshop Report (October, 1999), Ecological Sanitation Pilot Projects were implemented in Harare: Hatcliffe Holding Camp, Musimboti EcoEdu Farm, Knuth Farm – Kufunda Village; in Mutorashanga – Ethel Mining Compound; in Uzumba-Maramba-Pfungwe, Nyagande Communal Lands; in Guruve – Muzika Primary School; in Marondera – Chihota Communal Lands and Seke Materera Secondary School, in Zvimba – Masiyarwa Communal Lands. Since the introduction of ecological sanitation technologies by a non-governmental organization, called Kufunda Village in Zvimba Communal Lands, there has been no known evaluation of the residents' perception of these technologies**.** It, thus, became worthwhile to determine rural residence perceptions towards ecological sanitation methods, as a way of assessing whether the invented technologies were solving the current ecological crisis.

Study Area

Masiyarwa Community Area in Ward 3 of Zvimba Communal Lands is located 95 km west of Harare on the high veld, with altitude ranging between 1500-1800m above sea level. It is generally flat with granitic basement complex. The sandy soils are well drained and low in organic content (Arex Mashonaland West Province, 2006). A tributary of the Hunyani River drains the northern end and the Musengezi River drains the southern end. The ward is in Agro-Ecological Region IIa, with rainfall ranging between 700-1000mm per annum with cool winters and moderate to hot summers. Forests are extremely depleted, marked by scattered remains of miombo (*Brachystegia*).

Zvimba District had a population of 220,763 with Korekore and Zezuru as main dialects. Ward 3 had a total population of 5,840 comprising 1,230 households (average family size of 5); of this 2,719 were male and 3,121 were female. Twenty-seven (27%) had access to flush toilets, 19% to Blair toilets, 15% to pit toilets, and 33% used the bush system (Central Statistics Office, 2002). Most farmers practiced subsistence farming.

METHODOLOGY

This was a *Descriptive Survey* of residents' perception on Ecological Sanitation Technologies. A pre-tested questionnaire was used to carry out personal interviews with beneficiaries triangulated with key informant interviews, focus group discussions, field observations, and secondary data sources.

A total of 57 slabs were molded in April 2001 in Madzima and Mujongondi Villages, and from these only 34 Arborloo were constructed to completion. For the purpose of the study, only the 34 functional Arborloos were considered. Sampling for the selection of respondents to the questionnaire was done at two levels: Firstly, *Stratified Sampling* of the population using EcoSan technologies in Madzima and Mujongondi Villages. A 60% split sample was used to select 18 beneficiaries from Madzima and two beneficiaries from Mujongondi village. Secondly, *Systematic Sampling* was used to select beneficiary households that participated in personal door-to-door interview surveys from register of beneficiaries provided by the village head.

Judgmental Sampling was used for specifying key informants for interviews; these were two Kufunda Village Community Based Implementing Agents, Masiyarwa Contact Farmer, Madzima Village-Head Secretary, and Kutama Parish Projects Chairperson. Judgmental Sampling was preferred to ensure the inclusion of people, who played a key role in the dissemination of the technology, thus had great influences over the technology's continuation. The non-beneficiaries focus group discussion consisted of all the nine non-beneficiaries who gathered at Masiyarwa Catholic Church for the starter-up meeting. Two focus group discussions were conducted, mainly with the women, to get to the bottom of the ecological sanitation acceptance levels.

Recording Tools (the camera, eye, pen, and paper) were used for recording field observations, especially non-linguistic aspects of human behavior. A checklist was used as a validation tool for responses obtained during interviews and proved very essential in overcoming issues of language barriers. Each objective response was analyzed separately and the data was categorized. Computer packages, especially Excel, was used to facilitate data analysis for the production of bar graphs, pie charts, line graphs, as well as double checking calculation for the variance, standard deviation, and mean. Computation of the mean, variance, and standard deviation was done for the key question analyzing inconsistencies in the acceptance levels for humanure.

RESULTS AND DISCUSSIONS

Perceptions toward the Structural Design of the Arborloo

The Arborloo was perceived as a "women's technology," since the digging of a meter deep pit and the construction of a temporary superstructure is something that women could do without seeking men's assistance. Other structural advantages cited included its light, portable slab that could be moved without too much effort and the use of little cement volumes for the construction. Shallow pits were also considered favorable since these allowed for the retrieval of objects that fall into the toilets. Also crucial was the use of ash for the Arborloo composting process, a neutralizer for acidic soils, typical to Zvimba District. Figure 1 summarizes the main structural design concerns raised by the respondents.

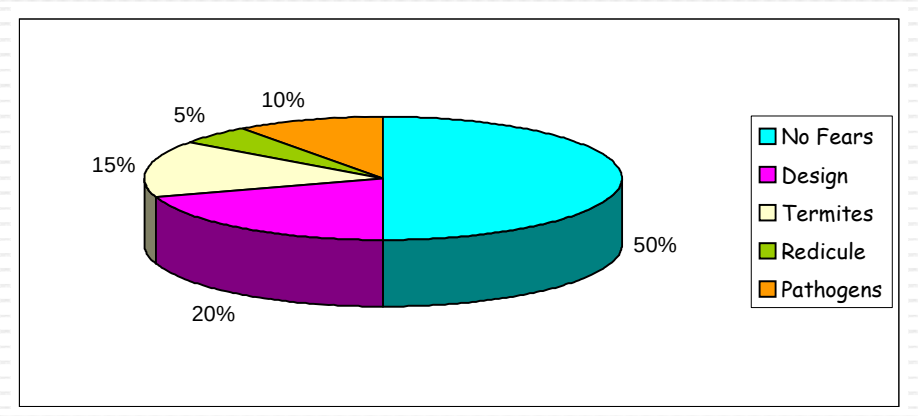

Figure 1: EcoSan Design Concerns

There were no fears and concerns raised by 50% of the respondents. The main structural concerns, raised by 20% of the respondents, included possible collapse and flooding of the pit during wet spells and collapse or cracking of the slab under a person's weight.

In both Madzima and Mujongondi Villages, the water table averaged 2 meters below ground level. Fifteen percent (15%) highlighted termites as causing a lot of damage to the superstructure, especially those made from wood or thatch, thus the need to resort to termite resistant materials. These presented a major challenge of reducing the attractiveness of the Arborloo since it changed their economic perception. Doubts were also raised by 10% of the respondents about the Arborloo's design capability to eliminate pathogens in excreta for its safe usage as manure, whilst 5% conceded to have been ridiculed for using the Arborloo based on the cultural perceptions of the repulsive nature of human excreta.

Socio-Cultural Perceptions on Acceptance of Humanure in Food Production

The perception towards the use of human waste in food production was a very crucial indicator of the acceptance level of EcoSan (Table 1). Generally, there was a negative perception towards the use of humanure in leaf, stem and root crops, with a clear show of disgust by the Manyika at the mention of such a prospect. The Manyika generally showed a lower acceptance level, with the Korekore partially accepting, while the Zezuru showed a more positive attitude. Perceptions then grew progressively positive towards the use for field crops, reaching an almost total acceptance for the usage in orchards, indicating why the Arborloo was acceptable within Masiyarwa Community. The older generation displayed greater acceptance of EcoSan than expected, considering that they had a greater cultural orientation. The non-beneficiaries focus group discussion yielded similar acceptance trends when they were asked to vote as a show of their preferences: $^{2}/_{9}$ accepted humanure usage for vegetables, $^{4}/_{9}$ accepted the usage in crop fields, and $^{9}/_{9}$ accepted usages in orchards.

Table 1: Perception towards use of Humanure in Food Production

Characteristic		Total No. Interviewed	Humanure acceptance in vegetables		Humanure acceptance in crop fields		Humanure acceptance in Orchards	
			No.	%.	No.	%	No.	%
Gender	Male	2	1	50	1	50	2	100
	Female	18	9	50	15	83.3	17	94.4
Dialect	Korekore	6	3	50	3	50	5	83.3
	Manyika	2	0	0	2	100	2	100
	Zezuru	12	7	58.3	11	91.7	12	100
Age	<20 yrs	4	2	50	4	100	4	100
	41-50 yrs	5	1	20	4	80	4	80
	51-60 yrs	5	4	80	5	100	5	100
	>60 yrs	6	3	50	3	50	6	100

The Adoption and Maintenance of EcoSan Technologies

The economic and ecological value placed upon EcoSan plays a vital role in its adoption. The Arborloo utilized the least possible amount of cement, and locally available material, making it one of the cheapest sanitation structures. For a technology to be widely adopted there has to be high confidence levels of replication and maintenance. It was worth noting that 90% of the questionnaire respondents were women, who witnessed to having been able to construct and operate their own toilets. There were high adoption levels by women in Madzima and Mujongondi Villages.

Table 2: Awareness and Maintenance Levels

Characteristic		Total No.	Sanitation Awareness Level %	EcoSan Maintenance Capacity. %	Anal cleansing Materials Leaves/Paper %
Gender	Male	2	100	100	100
	Female	18	94.4	94.4	83.3
Dialect	Korekore	6	100	100	83.3
	Manyika	2	100	100	50
	Zezuru	12	91.7	97.7	91.7

From the survey, EcoSan was 100% appreciated as providing social convenience during defecation. Of equal importance were also the levels of health and hygiene awareness, as well as anal cleansing materials used by concerned individuals. Awareness levels were discovered to be higher among the beneficiaries and significantly low for the non-beneficiaries, as illustrated in Table 2

Sanitation facilities Preferences

The preference of sanitation facilities usage analysis revealed that 20% of the respondents preferred the Water Closet, 20% preferred the VIP, and the remaining 60% specified the Arborloo as their preferred EcoSan facility. Figure 3 illustrates these findings.

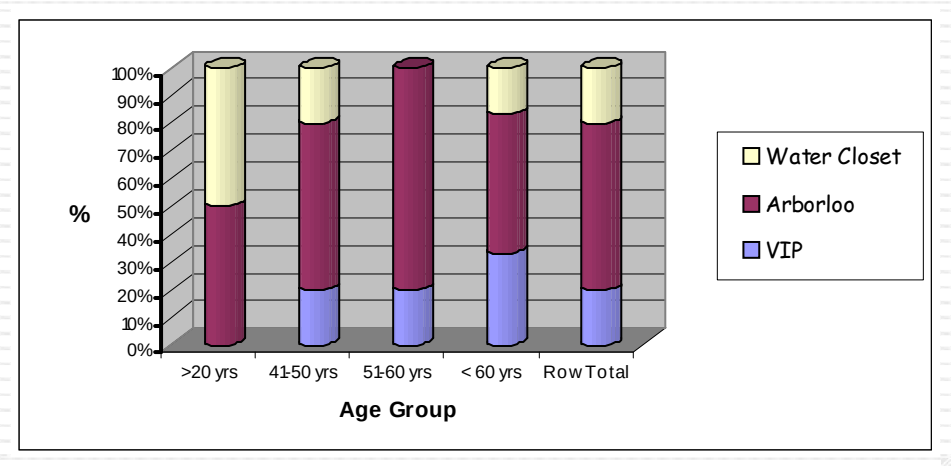

Figure 3: Preference comparisons for the Water Closet, Arborloo, and VIP

An analysis for preferences by gender and dialect is illustrated in Table 3 (below). Women displayed greater positive perceptions towards EcoSan, and so did the Zezurus. They perceived the latrine as less demanding in all its aspects than the Blair toilet, especially during excavation, construction and maintenance.

Table 3: Preferential use of Sanitation Structures by Gender and Dialect

Characteristic		Number of Respondents	VIP Preference	Water Closet Preference	Arborloo Preference
		No.	%	%	%
Gender	Male	2	100	0	0
	Female	18	11.1	22.2	66.7
Dialect	Korekore	6	33.3	16.7	50
	Manyika	2	50	0	50
	Zezuru	12	8.3	25	66.7

CONCLUSION AND WAY FOWARD

The thrust behind the technological imperative which states that 'when we invent it, we are required to use it' (Hall *et al*, 1992), is that when a new technology is invented, research should be done to determine how best to utilise the inventions. Thus, there is faith that technical inventions could solve ecological problems and that further technologies can solve the problems created by the technological solution to the previous problems.

The Arborloo was well received by Masiyarwa residents, the main perception being as a social solution to their sanitation problems, and to a lesser extent as a composting toilet. There was generally a high level of functionality of the Arborloos, mainly because 20% of the beneficiaries were drawn by selection and 80% were on a voluntary basis. A voluntary approach is usually preferable for new technologies that have the potential of raising cultural controversy. It was also concluded that transformation is usually gradual, and there was some preference for the known VIP.

Low technical sensitisation was apparent from observation at most of the households. This was evidence that the soil, ash, and leaves mixture was not being applied after each toilet visit. New technologies should be easy to understand and operate. The moment it poses challenges and complications for the intended beneficiaries, then the tendency is for them to develop a negative perception and, thus, shun it. The Arborloo was perceived as a "technology for women" in Masiyarwa since widows managed to dig the meter-deep pit, and have been operating their Arborloos without men's assistance, as was the case with VIPs. Women were boasting that a technology that considers women's plight and targets women is definitely bound to succeed.

The major consensus was that during a technology's introductory stage, awareness campaigns should target local community leaders, mainly councillors, chiefs, and kraal heads, empowering them, such that when they develop a positive perception, they become crucial in the mobilisation of the rest of the community. Awareness was deemed equally important for beneficiaries, as well as continuous education and monitoring of the structures during the introductory phase to eliminate inappropriate use of the technology, as well as providing solutions for possible day-to-day crisis.

Exchange visits were recommended to complement sanitation awareness and education, because it is in human nature that one has to see first in order to believe, and also, the fact that experience is the best teacher. Sharing experiences with those who already have EcoSan structures would move a milestone in converting people's perceptions into more positive ones. More emphasis was called on

the construction and presentation of demonstration structures to simulate “on the job training” boosting confidence levels, since everyone learns while participating. Demonstration structures erection was recommended for churches, schools, or community halls, as reminders and ways of spreading the gospel. Implementers were tasked to provide cement and reinforcement wire, which are the most expensive components, for the initial construction, while beneficiaries provide wire (coarse and fine aggregates), as well as the materials for the roof and superstructure. The recommendation was in line with the “local contribution” policy that was enforced to boost project ownership and ensure project continuity.

Beneficiaries were asking for termite-resistant superstructure materials, or alternative solutions to termites’ infestation. A negative perception was slowly forming in the beneficiaries’ minds, due to the termite menace experienced by Masiyarwa Community. As people have always perceived the toilet as serving both the waste excretion and bathing purposes, there were recommendations for the attachment of a bathroom compartment to the Arborloo. There were also recommendations for having a double compartment latrine. The last recommendation was for improvements to the pit that would counter flooding and pit collapse in the case of Masiyarwa area where the underground water table was exceptionally high. It was felt that before the technology implementation, an assessment of the water table level was necessary, because flooding and pit collapse negatively affect the community’ perception about EcoSan technology. Given the appropriateness of the technology in the reuse of human wastes in a more productive way, there is more scope for spreading the EcoSan technologies to other communities across the country. However, this has to be done basing on the social acceptance levels of the targeted communities, as well as the physical realities of the area. It would be more appropriate if such a technology is spread into the newly resettled areas where sanitation coverage is very low.

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