Journal of Sustainable Development in Africa (Volume 12, No.1, 2010)

ISSN: 1520-5509

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A PRELIMINARY ASSESSMENT OF THE GENDER SENSITIVITY AND HEALTH RISK POTENTIAL OF ECOLOGICAL SANITATION (ECOSAN) IN MARONDERA RURAL DISTRICT, ZIMBABWE

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ABSTRACT

This study was carried out in Marondera Rural District, Zimbabwe to investigate the gender sensitivity, health risk potential, degree of comfort and stakeholder involvement specifically for the urine diversion dry toilet (UDDT). It was found that women were predominantly responsible for cleaning the toilets while men were generally responsible for installation of the systems, harvesting the excreta from the toilets and its application on the fields. Respondents perceived the health risk potential of UDDT as lower than other alternative sanitation systems in the area. During menstruation there were more female respondents (60%) were comfortable with the use of their toilets for NON-UDDT owners compared to UDDT systems owners (40%). It was concluded that there was some gender-bias regarding distribution of responsibilities. Appropriate devices should be added to the UDDT to improve comfort of use for women and to enable the use of the UDDT for bathing purposes.

Keywords: gender-sensitivity, health risk, urine diversion dry toilet

INTRODUCTION

Major challenges concerning sanitation at present as well as in the long-term perspective are the inadequacies of current sanitation options, the vast number of people lacking sanitation, the negative health effects of poor sanitation, water shortage and pollution, food insecurity and urban growth

(Dellström Rosenquist, 2005). Facts from WHO/UNICEF (2006) suggest that every year, unsafe water, coupled with a lack of basic sanitation, kills at least 1.6 million children under the age of five years. It is estimated that globally at least two billion people have inadequate sanitation (Paterson *et al*., 2007). In sub-Saharan Africa sanitation coverage has not kept pace with population increase, having dropped from 60% in 1990 to 47% in 2000 (Waterkeyn & Cairncross, 2005).

Even the very simple "drop-and-store" sanitation models, such as the pit latrines used in many parts of Africa, have their limitations and risks as they cannot be used in areas with impenetrable ground, high water-tables or where flooding is a problem (Hannan & Andersson, 2002). In addition, a limitation in most existing models (including pit latrines) is the failure to return natural fertilizers contained in human excreta to the land, which means that a valuable resource (human excreta) which could restore depleted soil nutrients is wasted. Chemical fertilizers are then required which, in turn, deplete other valuable, finite resources, such as fossil fuels and phosphorus (Hannan & Andersson, 2002). One of the criticisms of the ventilated improved pit (VIP) latrine has been that, for a seemingly low-cost technology, it is relatively expensive (Robinson, 2002). Pit latrines have proven to be health and environmental hazards due to leakage of effluent into the groundwater (Hannan & Andersson, 2002; Dellström Rosenquist, 2005). Furthermore the 'drop-and-store' model involves the risk of groundwater contamination and keeps nutrients out of the agro-ecological cycle (Nawab *et al*., 2006). In Kosovo and Southern Siberia elevated concentrations of nitrate (in excess of 100 mg/l) were reported in groundwater due to a high density of pit latrines, posing dangers of methaemoglobinaemia for small children (Banks *et al*., 2002). Pit latrines can also be rejected by potential users because of smell and flies (Hannan & Andersson, 2002).

According to Nawab *et al*. (2006), an innovative 'sanitize-and-re-use' or 'ecological sanitation' model is emerging in some parts of the world applying the principles of 'don't mix', 'don't flush', and 'don't waste' the human excreta. This model involves toilets with a front bowl collecting the urine and a rear bowl collecting the faecal material. An important feature of ecological sanitation (ECOSAN) is considering excreta as a resource to be recycled rather than as waste to be disposed of (Dellström Rosenquist, 2005). Other studies suggest that although not a pre-condition for the implementation of ECOSAN, re-use of the excreta resource should be an additional benefit for people wishing to make use of it (Austin et al., 2005). Ecological sanitation has been shown to be economically feasible and environmentally sustainable (Vinnerås, 2002; Nawab *et al*., 2006). In a study by Mackie Jensen *et al*. (2008), respondents reported that excreta has a long-term positive effect on the soil compared to inorganic fertilizers, which work very effectively but only for a short

while. Guzha *et al*. (2005) claimed that yield increased by about 250% when using a combination of faeces and urine and by 166% for commercial fertilizer when compared to a control site of no nutrient application. The cost of commercial fertilizers cannot be afforded by most poor societies and this is also the sector that does not have access to cattle manure, thereby forcing these people to do without these fertilizers (Guzha *et al*., 2005). Thus UDDT is a potential source of natural fertilizers for this group of people.

The annual amount of human excreta of one person corresponds to the amount of fertilizer needed to produce 250 kg of cereal which is also the amount of cereal that one person needs to consume per year (Heinonen-Tanskia & van Wijk-Sijbesma, 2005). Human urine is a valuable source of nutrients that is used to varying extents for crop fertilization in countries such as Mexico, Germany, USA, Sweden, Denmark and Zimbabwe (Mnkeni *et al*., 2008). However, according to the Water Research Commission (2006), even faeces from healthy humans contain live viruses, most of which are plant viruses that could sicken and deform plants. In order to achieve the UN Millennium goal on sanitation, ecological and conventional sanitation technologies must be developed in close collaboration with the users (Nawab *et al*., 2006). Sanitation technologies need to suit local materials and building practices, local economic conditions, and local cultural practices and beliefs (Robinson, 2002). Hannan and Andersson (2002) highlight that the contribution of ecological sanitation will be significantly enhanced if gender perspectives are an integral part of future developments. The importance of involving both women and men in the management of water and sanitation has been recognized at the global level (UN Water, 2006). Gender refers to the roles and responsibilities of men and women and the relationship between them. These roles and responsibilities are culturally specific and can change over time (UNDP, 2003). However, cultural factors affecting the choice of sanitation solutions have not yet been sufficiently investigated (Nawab *et al*., 2006). Nyoni *et al*. (2001) also highlight that gender sensitivity of ECOSAN and associated health risks remain issues to be studied.

In 1985, Zimbabwe launched the Integrated Rural Water Supply and Sanitation Programme aimed at improving access to safe drinking water supply and sanitation facilities in rural areas, and included the target that every rural household should have a VIP latrine[1] by 2005 (Robinson, 2002). Reduced government financing for rural water and sanitation (WATSAN) infrastructure (in Zimbabwe) has

[1] *The VIP latrine is an improvement of the pit latrine by adding a vent pipe fitted with a wire gauze at the top end to trap flies. It was invented by the Blair Research laboratory in Zimbabwe and is commonly known as the Blair toilet in Zimbabwe.*

given rise to community-based management of WATSAN infrastructure (Hoko & Hertle, 2006) and has resulted in appropriate technological innovations in the provision of WATSAN. Recently ecological sanitation (UDDT) has been promoted in parts of Zimbabwe including Marondera rural district mainly by some local non-governmental organisations (NGOs) in collaboration with government.

The objectives of this study were to investigate the gender sensitivity in ECOSAN with respect to the menstrual cycle, harvesting and application of human excreta on agricultural land as well as the health risk potential**.** This study was carried out in Wards 12 and 14 of Marondera Rural district in Zimbabwe in November 2005.

STUDY AREA

The study was carried out in Marondera Rural district (Figure 1). The district is subdivided into 15 Wards and of these the study covered only two namely wards 12 and 14 as these are some of the few wards where the UDDT has been implemented in the district. According to CSO (2002), ward 12 had a population of 5,947, while ward 14 had 6,414 people. The respective percentages for females and males were for ward 12 (53% and 47%) and for ward 14 (51% and 49%). The average population per homestead in the district was 4.1 people. The geology is predominantly gneiss rocks while the soils are generally sandy with a high permeability resulting in a high groundwater pollution potential when pit latrines are used. Marondera Rural district has generally a high water table, which in some instances may be 2 m or less below the ground level during January/February, the peak of the rain season (Dzwairo *et al*., 2006).

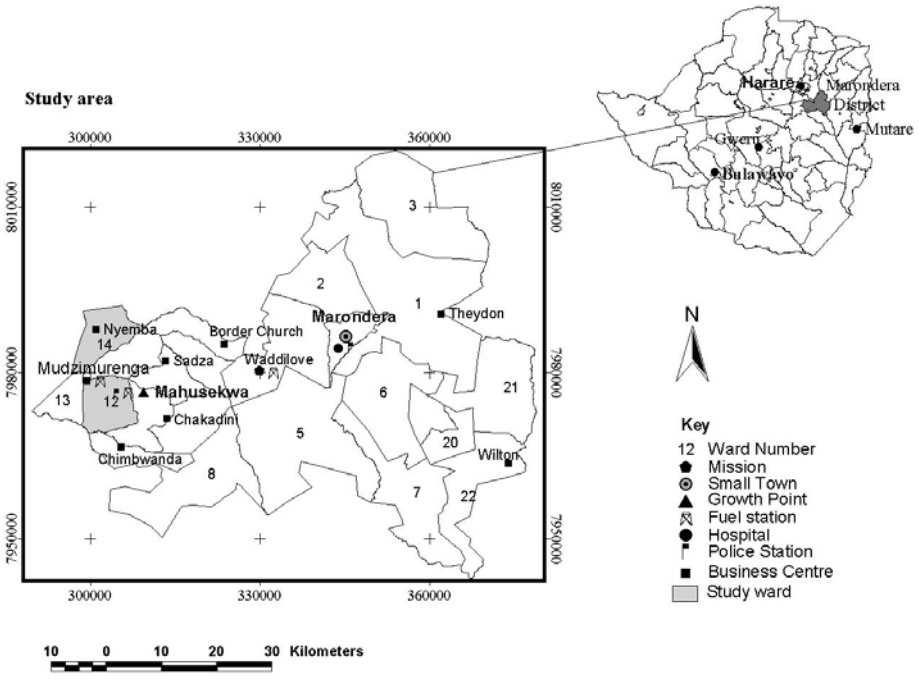

Figure 1: Study Area, Marondera Rural district, Zimbabwe

Source: Department of Geography and Environmental Science at the University of Zimbabwe

GENERAL BACKGROUND ON THE UDDT TOILET IN ZIMBABWE

The UDDT toilet in Zimbabwe has been advocated for and installed by some Local Non-Governmental Organisations (NGOs) in a number of rural districts and peri-urban areas. In the study area some NGOs working together with government have been promoting the implementation of the UDDT in the area since 2003 and are currently promoting hygiene and safe use of human excreta for crop production. The toilet consists of a superstructure, which houses a shank, which can be made of concrete or other synthetic materials. Below the toilet shank is a compartment known as a vault, which is for the collection of the faecal matter usually by a plastic dish housed in the vault or collected on a concrete floor. A urinary designed differently for the two sexes are used to collect urine which is then led to a container (outside the toilet) by a tube or pipe. Typically containers of urine are in the form of 20 l plastic containers. The urinary for women is normally moulded as a single unit together with the faecal matter shank while the one for males is separate from the faecal matter shank. This follows the design of conventional toilets systems in which a separate urinary and faecal matter shank has been used in male toilets and a single shank for both faeces and urine has been used for women.

The stabilization of the faecal matter (to eliminate pathogens) is generally by dehydration and drying of the faecal matter for some 6 to 8 months before the stabilized excreta manure is ready for application to land. Storage of excreta in some form of compost is for both further treatment and accumulation of the manure to significant quantities. The manure is often applied to the land before planting of crops and is also used in the early stages of the plant growth. Urine is sterilized by keeping it in the plastic containers and exposed to hot/warm environment (sunlight in most cases) for a period of about 3 months before application to the fields normally in the latter stages of the plant growth, as it is thought to be rich in nitrogen. Of late the cost of plastic containers has given rise to the emergence of other innovations of urine storage and application. According to Annika Sundin *et al*. (1999), urine contains the largest fraction of nitrogen (80%) and phosphorus (60%) in human waste and these nutrients are present in a form readily available to plants. These values are comparable to those reported by Schönning *et al*. (2002) of nitrogen (80%) and phosphorus (55%).

STUDY METHODS

Questionnaires and field observations by the study team were the main study tools used. Questionnaires were administered on homesteads selected randomly in terms of the geographical spread of location. A total of 33 homesteads having UDDT, and 15 homesteads having other alternative sanitation systems in the area and no UDDT were chosen for the study[2]. One person was interviewed per household and these were generally household heads or spouses of heads and in a few cases the most mature person present was interviewed. The issues covered by the questionnaire were grouped into three categories. The first group centred on general operation and maintenance of the toilets including vector occurrence and related reported diseases, the second examined the community's gender perceptions on the sanitation options, how well they worked and what problems were associated with their usage for the different gender groups, while the third category focused on the use of the sanitation systems during menstruation period (menses) as well as the perceived health risks related to use of the sanitation systems during this period. The Non-UDDT systems were studied to assess the differences in perceptions on the issues studied between those using UDDT and those using other systems in the area.

[2] *Later in the paper homesteads having UDDT toilets have been referred to as UDDT homesteads and those without UDDT have been referred to as NON-UDDT homesteads.*

RESULTS AND DISCUSSION

Gender sensitivity

Women accounted for 64% of the 33 people interviewed at UDDT homesteads, while men were 36 %. The distribution of the sexes of the 15 interviewees for NON-UDDT homesteads was 53% males and 47% females.

Installation of the Sanitation System

It was found that other sanitation systems, such as pit latrines, were also installed at UDDT homesteads. UDDT was the major sanitation system used according to 85% of the respondents at UDDT homesteads while pit Latrines and Blair toilets accounted for 100% of the sanitation systems used at NON-UDDT homesteads. The installation of the UDDT systems were done by women according to 39% of the responses while 50% of the respondents reported that men installed the systems and the remainder reported that both men and women were responsible for the installation of the system. According to 93% of the respondents from NON-UDDT homesteads, men did the installation of the systems. According to Hannan & Andersson (2002), men in most areas in the South do the construction of latrines. In this study (Marondera), in most of the areas where the UDDT systems were installed, the local NGO offered part of the building materials, technical assistance for the construction of the system, and training of locals to construct the systems. The community roles during the construction of the UDDT systems could have been predominantly of a support nature. From the results it is clear that men were frequently responsible for the installation of the systems both UDDT and pit latrines.

Harvesting of the Excreta

When asked about the responsibility to remove the faecal matter from the vault of the UDDT system, 45% of the respondents highlighted that men and boys were responsible, 31% claimed women and girls did that and 24% reported that anyone could carry out that task. Elsewhere the responsibility for removing the excreta has been more often for women compared to men. In a study in Machaki village in North West Frontier Province of Pakistan, villagers were initially reluctant to talk about excreta, considering this a private or internal matter, but were comfortable in talking about sanitation, which is considered external (Nawab *et al*., 2006). In this study the possibility of respondents being reluctant to discuss sensitive issues was minimised by ensuring that female interviewees were interviewed by female members of the study team while male members of the study team interviewed male interviewees. Men and boys were responsible for installing and

empting the urine collection system according to 41% of responses while women and girls were said to do this by 34 % of the respondents. The remaining percentage reported that anyone at the homestead could do this. Generally men remove both faecal matter and urine from the UDDT.

Cleaning of the Sanitation System

The routine cleaning of the toilet at UDDT homesteads was the role of women and girls as reported by 83% of respondents while for men and boys this was 3%. For the remaining percentage it was said that this was a task handled by anyone. In 93% of the cases respondents from NON-UDDT homesteads highlighted that women were responsible for the cleaning of the alternative systems. Generally the respondents (both men and women) were of the opinion that the cleaning of the toilets was customarily the responsibility of women. Women were often chosen to do the cleaning of sanitary facilities on the basis of widely held beliefs that they posses intuitive capabilities in matters of order and cleanliness for instance, even if the entire family defecates, it is the responsibility of the women to clean the latrine (Avvannavar and Mani, 2008). In most societies, women have a primary responsibility for management of household water supply, sanitation and health (UN Water, 2006). However, in this study most of the women interviewed felt that they had become professional cleaners of the Blair, pit latrine and UDDT toilets, and felt this was not fair although they acknowledged that the cultural setting promoted this. According to Dunstan & Associates (1998), power dynamics demands that when an undesirable chore has to be performed, the most powerful members of the family are not required to perform that task. While men in most areas in the South do the construction of latrines, women are usually responsible for keeping them clean and useable and also assist children, the aged and the sick with their hygiene and sanitation needs (Hannan & Andersson, 2002). Findings in this study seem to agree with this. This study established that women are commonly responsible for cleaning of the toilets. Although women to some extent appeared not happy about the cleaning of the toilets, there appears to be some defined and culturally acceptable distribution of roles in sanitation management.

Reuse of Excreta in Agriculture

In terms of reuse of the excreta from UDDT systems, the leading role in application of the faecal matter in the field was taken by women and girls according to 36% of responses and by men and boys as reported by 43% of the respondents. Urine application was predominantly the responsibility of women and girls according to the responses of 36% of the people interviewed and 40% claimed men were the key persons for this task. The remaining fraction of the responses on the aspect of the application of faecal matter and urine accounted for those responses which suggested that the roles

were equally for men and women. Based on the responses, it appears men take a leading role in the application of excreta (faeces and urine) in the fields. In focus group discussions in a study in two communes in Central Vietnam, the male participants showed a greater interest in discussing the agricultural benefits of composting than the female participants (Mackie Jensen *et al*., 2008). Possibly this factor could also explain why men appear to be more involved in excreta handling and application in the study area. It is concluded that men are predominantly in charge of the application of the excreta in the fields.

Health Risk Potential

Use of System and Excreta Handling

Some 80% of the respondents from UDDT homesteads claimed that the health risks were lower for UDDT compared to other alternative systems used in the area such as pit latrines, while 3% perceived the risk to be the same and 13% felt they were higher and the remaining fraction was not sure. Some 45% of the respondents from NON-UDDT homesteads felt there were risks associated with the use of their system. When compared to the UDDT, respondents from NON-UDDT homesteads felt that their systems had a higher disease potential (50% of respondents) compared to UDDT, while 14% felt the risks were the same, 21% felt they were lower while the remaining portion was not sure. Health risk potentials in this study were probed by asking the respondents if they would contract any disease if they used a sanitation system. A greater proportion of the respondents from UDDT homesteads were of the feeling that the risks were more during removal of excreta and application in fields compared to during excretion. Illness and disease risks due to improper sanitation are attributed to the bad smell and repulsive appearance of excreta (Avvannavar & Mani, 2008). In the study area most pit latrines were old, cracked, full and smelly. Conversely the UDDT systems were relatively new. This could have affected the perception set of the respondents. Perception set is the readiness to perceive a stimulus in a certain way and may be affected by a number of factors among others the individual's experience, personal observations or hearsay (Smith and Crocker, 1995). The fear of human faeces which, is related to the fact that they are malodorous and potentially dangerous—a fear which, to some extent is rational, has proven to be one of the key obstacles for the implementation of sustainable sanitation systems (Dellström Rosenquist, 2005). In Marondera, some of the respondents expressed fears of possible contracting of diseases during harvesting and reuse of the excreta as it was felt that most people in the community could not afford protective clothing like gloves and masks. It is highly possible that emptying latrines and handling excreta in the household premises are associated with the spreading of large quantities of infected eggs and other pathogens present around the household environment (Mackie Jensen *et al*., 2008).

Farmers interviewed in a study in Central Vietnam explained that they did not use masks, boots, or gloves when applying excreta in the fields because it was not practical and also because the human faeces used was composted, dry, and without smell (Mackie Jensen *et al*., 2008). In this study (Marondera) the faecal excreta is composted for 6 to 8 months before use while urine is stored in plastic containers for periods of 3 months. Danish regulatory standards require that urine is stored 6 months in a sealed container before use (Magid *et al*., 2006**).** By containing faeces during an approximate period of 8–12 months depending on climate, in addition to contributing to their dehydration and decomposition the faeces are then sanitized and fit to be used as soil conditioner (Dellström Rosenquist, 2005). The Vietnamese guidelines on excreta use recommend a minimum composting period for faeces of 6 months inside the latrine since this is regarded as sufficient time to kill the *Ascaris* spp. eggs which are the helminth eggs known to maintain the longest viability with potential for infection up to 1 year following an exposure to the external environment (Mackie Jensen *et al*., 2008). One common method for disinfection of faecal matter in developing countries is the use of ash for raising the pH (Vinnerås *et al*., 2003). In the study area (Marondera) ash is used as a drying agent and is added to the vault after excretion of faecal matter. A study in Vietnam by Mackie Jensen *et al*. (2008) also reported that in 99% of cases, ash was used during composting of excreta.

There were perceived health risks associated with both the UDDT and the NON-UDDT toilet. Respondents from both the UDDT and NON-UDDT homesteads perceived the health risks to be lower for UDDT compared to other systems used in the study area. For UDDT health risks were perceived to be more during excreta handling and re-use as compared to during excretion. The composting time for faecal matter could be inadequate based on recommendations from some literature especially for the destruction of *Ascaris*. The storage period for urine also appears lower than recommendations from elsewhere as reported in literature. However the average temperature of the study area could be higher than that of the areas on which the recommendations from literature are based on, meaning the period required for effective sterilization/stabilization in Marondera.

Risks due to Consumption of the Crops

Some of the respondents reported a noticeable elevated rate of decay of the maize cob in fields were the excreta was applied, raising fears of contracting of diseases through consumption of the crops. The same group of respondents also reported an elevated proliferation of worms in the fields where human excreta was applied. Vinnerås *et al*. (2003) mention that the three main transmission routes

for *Ascaris* and other intestinal diseases are transmission from faeces-contaminated surfaces and materials, transmission to workers in fields that have been fertilized with faeces and transmission by consumption of vegetables fertilized with faeces. Only a few pathogens, mainly found in tropical areas, are known to use urine as a significant route for transmission but any faecal cross-contamination that may occur has been regarded as a possible health risk associated with ecological sanitation systems (Schönning *et al*., 2002). Magid *et al*. (2006) and Mnkeni *et al*. (2008) also point out that human urine does not generally contain pathogens that can be transmitted through the environment; however, one inevitable source of pathogens in urine collected from the urine-diverting toilets is cross-contamination from faeces**.** Therefore, possible cross-contamination of urine by faeces means the urine should not be generally considered as sterile and should therefore be treated before reuse. The risk for faeces to contaminate the urine is probably highest during episodes of diarrhea or when children use the separating toilet and this constitutes the health and hygiene risks associated with the reuse of source-separated urine in agriculture (Schönning *et al*., 2002). Cross-contamination of urine by faecal matter is highly possible given the degree of discomfort reported by women (in Marondera District) when using UDDT (see section on Degree of comfort). In this study, urine is stored in plastic containers for 3 months to achieve sterilization. As already presented in the section on use of system and excreta handling, recommendations elsewhere suggest 6 months although the temperatures in those areas (Denmark) are generally lower than those in Zimbabwe. In this study, cholera[3] and diarrhoea were reported as major possible diseases although a few respondents mentioned dysentery and bilharzia. However, these diseases were reported not to be frequent by most of the respondents and also a large proportion of the interviewees did not link the few cases that had occurred to the sanitation system. This study did not seek to establish the exact causes of the diseases. Mackie Jensen *et al*. (2008) emphasized that human faeces could be harmful to health and mentioned that contact with human faeces could cause diarrhea and intestinal diseases, as well as lung diseases.

Consumption of the crops could pose a health risk based on the fact that an elevated rate of decay of the maize cob was observed in fields were the excreta was applied coupled with the proliferation of worms in the same fields.

Use of the Sanitation Systems

Degree of Comfort

[3] *The fieldwork for this paper was carried out before the cholera outbreak of 2008/9 in Zimbabwe. It would be interesting to explore practice and attitudes of the different sanitation systems as a result of the cholera outbreak.*

Comfort was related to convenience of use and existence of odour. Respondents from UDDT homesteads felt that their systems were more comfortable compared to other alternative sanitation systems in the area, according to 50% of the responses, while they were deemed to be of the same comfort by 5% of the responses and less comfortable (9%) The remaining 36% were not sure of how to rate the degree of comfort. On the other hand, 27% of the respondents from *NON*-UDDT homesteads felt their systems were more comfortable than UDDT, while 7% felt the degree of comfort was the same and 20% felt it was less and the remaining 46% was not sure. The large fraction of respondents who were not sure could be explained by the fact that most of the respondents from *NON*-UDDT homesteads could possibly not have owned or used a UDDT toilet before and were therefore likely not to be able to make comparisons. Most respondents from UDDT homesteads were likely to have owned other systems before installing the UDDT (which is fairly new in Zimbabwe), thus they were likely to effectively compare the UDDT to other systems. It was also observed that in general homesteads with UDDT still had other forms of sanitation such as pit latrines, which they probably constructed before the introduction of UDDT. According to reports from female interviewees, it was quite a challenge when it came to separating urine from the faecal matter during excretion. One had to get very close to the female urinary to avoid urine entering the faecal matter chamber (or vice versa) thus creating huge possibility of spoiling the floors and coming into contact with the shank and cross-contamination of the urine by faecal matter. Women's perceptions, needs and priorities in relation to sanitation can be quite different from men's (Hannan and Andersson, 2002).

There was no odour associated with UDDT according to 76% of the respondents from UDDT homesteads, while 24% felt there was odour associated with UDDT system. For *NON*-UDDT homesteads, 87% felt there was odour associated with their sanitation system and 13% reported that there was no odour associated with their sanitation system. The technical idea behind ecological sanitation is to keep urine and faeces separated so that the faeces dry quickly and smell minimally (Dellström Rosenquist, 2005). The addition of ash, a practice common in the study area (Marondera), has been reported to lower the moisture and thereby the smell (Mackie Jensen *et al*., 2008). This could possibly explain why the odour was deemed lower for UDDT toilets compared to pit latrines. In the area UDDT is relatively a new technology, which has been in existence for less than five years while most of the pit latrines were old, full, smelly and prone to collapse. For all households studied the age was reported to be at most 4 years for UDDT and predominantly (>50%) 5 to 19 years for other systems. Dzwairo *et al*. (2006) suggest that the cracking and sinking of pit latrines in the area might be due to a high water table, soil type and geological set-up. So the negative perception on pit

latrines could have been affected to some extend by the age and status of the pit latrines. No background surveys were carried out before this study and this could affect the interpretation of the findings on the perceptions.

It was found out that women found the UDDT toilet difficult to use in most cases especially on the aspect of separating urine from faeces. The respondents from UDDT homesteads appeared to report lower frequencies of odour compared to those from NON-UDDT homesteads.

Comfort of use During Menstruation Period (Menses)

Only female interviewees were considered to assess the degree of comfort during menses (21 for UDDT homesteads and 8 for NON-UDDT). For UDDT homesteads, about 40% of the respondents continued to use the UDDT during menses while others resorted to other forms of sanitation. Some 60% of the respondents from *NON*-UDDT homesteads reported that they continued to use their sanitation system during menses while the remainder resorted to other sanitation alternatives. Most of the respondents from the UDDT systems who continued to use UDDT during menses were not comfortable with using the UDDT during menses, while those who continued to use their system for NON-UDDT homesteads reported no change of degree of comfort in using their sanitation system during menses. The reduced comfort for UDDT users may be related to the disposal of the sanitary pads, and the fact that most sanitary pads are not biodegradable.

When all those interviewed (both men and women) from NON-UDDT homesteads were asked whether the use of the sanitation systems by women during menses posed some health risks, 50% felt that there were no risks while 7% perceived there could be risks and 43% were not sure. Female respondents raised concerns on the user unfriendliness of UDDT toilets during menses, which does not allow for cleaning of bloodstains from the toilet seat using water. Entry of water in the vault, which stores faecal matter, delays the drying of the faecal matter. Drying is the major process for stabilizing the faecal matter before application to land. Reports from discussions with female users of UDDT in parts of Harare such as Dzivarasekwa and Hatcliffe suggest that the use of the UDDT toilet by women during menses caused clogging of the urine collection pipes. For a community, various factors such as privacy, convenience and status are a more important aspect of sanitation systems (Wegelin-Schuringa, 2002). Nawab *et al.* (2006) highlight that the people's primary criteria for choosing a sanitation model are prestige, privacy and comfort with little consideration for health and the environment, which is consistent with research findings from other cultures. Concerns were also

raised (more frequently by men) over possible exposure to HIV during contact with or transportation or land application of the excreta as a result of blood "contamination" during menses.

More female respondents continued to use their sanitation system for NON-UDDT homesteads compared to those from UDDT homesteads. The majority of female respondents from UDDT homesteads were not comfortable with the use of UDDT during menses while those from NON-UDDT homesteads felt there was no change in the degree of comfort during menses. The UDDT system was deemed not user friendly during menses by female respondents. Respondents especially men felt the use of the UDDT toilets during menstruation posed health risks during transportation and application (to agricultural land) of excreta affected by menses. Generally the perception that there were health risks when sanitation systems were used during menses was higher for UDDT systems compared to NON-UDDT systems.

Stakeholder Involvement

This section presents results of an assessment of stakeholder involvement only for UDDT homesteads. In 68% of the responses a family member was involved in the planning and design and implementation of the UDDT while some 25% reported that no family member was involved in the planning and design and implementation of the UDDT system, and 7% was not sure. Most interviewees however reported that men and village heads were mostly involved. It could not be established whether the participation was active or passive. Like with most donor driven initiatives in Zimbabwe, there were incentives for the implementation of the UDDT system including provision of building materials and technical expertise (builders). It is believed that involving stakeholder participation particularly women in the decision-making processes of planning and design may result in more acceptable and gender-friendly sanitation technologies. Often women play a vital role in the day-to-day operation and maintenance of water and sanitation systems particularly identification of malfunctions and faults. They are also commonly responsible for cleaning the systems thus having more opportunities to observe the systems compared to men. This study also found out that women clean the sanitation systems more frequently than men (see section on Gender sensitivity). Experiences over the past decades demonstrate that even the technically best-designed programmes fail or produce meagre results, because decision makers and intended beneficiaries are not adequately consulted, informed, educated or mobilized (Wegelin-Schuringa, 2002). As an example, in India compost pits located outside villages went unused and women continued to deposit waste near their homes - even when fined for doing so - because they did not wish to be seen carrying loads of refuse to the outskirts of the village (UNDP, 2003). Lake of consultation was seen as the problem.

Waterkeyn & Cairncross (2005) suggest women's clubs as a way of promoting improved sanitation and hygiene behavior. The concept of a club is in line with traditional values of conformity in rural society and builds on a long history of women's' groups developed throughout the colonial period through the missionaries and philanthropic societies developed in Zimbabwe (Waterkeyn & Cairncross, 2005). The challenge in mobilization for sanitation is that human waste disposal is on the one hand an extremely individual issue as the use of toilets and hygiene behaviour is a private subject in most cultures (Wegelin-Schuringa, 2002).

In over 50% of the cases it was reported that a family member was involved in the planning, design and implementation of the UDDT sanitation system. It was also found out that men were more involved in the planning, design and implementation of UDDT systems compared to women. Incentives offered by the donor spearheading the project could to some extend affect the participation.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From the study the following conclusions were drawn:

(1) Men and boys were frequently responsible for the installation of the sanitation systems. They were also predominantly responsible for the removal of the excreta (urine and faeces) and for the application of the excreta on agricultural land for reuse. Women and girls were frequently responsible for the cleaning of the toilets and appeared generally uncomfortable with this task, although both male and female interviewees generally felt that the cleaning of the toilet is the role of women according to societal norms. There is therefore a gender bias on the distribution of roles which appear to be culturally defined and acceptable.

(2) There were more negative health risk perceptions for NON-UDDT systems compared to UDDT systems. The perceived health risks were thought to result in diarrhoea and cholera. For UDDT the risks were perceived to be higher during excreta removal and application to land (compared to during excretion).

(3) In general respondents who use UDDT are of the opinion that their systems are more comfortable as compared to other alternative systems in the area such as Blair and pit latrine toilets. More people complained of odour problems (87%) for NON-UDDT homesteads as compared to those from UDDT homesteads (24%).

(4) More female respondents were comfortable with using NON-UDDT systems during menstruation as compared to those using UDDT systems. There appears to be reduced comfort for those from UDDT homesteads during menstruation while those from other systems seem to suggest that there is no change of comfort during this period. The degree of discomfort for those from UDDT systems is worsened by the need to minimise water use (needed more during this period by women) as this will result in water entry into the faecal vault, and consequently affect the stabilization of the faecal matter by drying.

(5) Effective stakeholder involvement, particularly women, was poor especially during the planning stage. It has generally been established elsewhere that effective stakeholder (users) involvement at all stages of a project or programme is key to the sustainability of the systems developed from the programme or project.

Recommendations

The following recommendations are suggested:

(1) Appropriate devices including soakaway should be added to UDDT so that it can be used for bathing and disposal of sanitary pads.

(2) Women should be effectively involved at all stages of the implementation of the sanitation solutions to ensure sustainability and acceptability of the system.

(3) The adequacy of the stabilization periods for the excreta (both urine and faeces) according to current practices in the study area needs investigation.

ACKNOWLEDGEMENTS

The authors would like to express sincere gratitude to the Institute of Water and Sanitation Development for financial and logistical support. Acknowledgement is also made to the role played by Mvuramanzi Trust during the execution of the study.

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