Assessment of social acceptance and scope of scaling up urine diversion dehydration toilets in Kenya
S. M. N. Uddin, V. S. Muhandiki, J. Fukuda, M. Nakamura and A. Sakai

ABSTRACT
A urine diversion dehydration toilet (UDDT) is a kind of toilet which can be used to recover resources such as nutrients and can also be an option to improve the sanitary situation in low income countries. A structured questionnaire survey, key informant interviews, participatory approaches such as focus group discussion (FGD) and mass gathering were carried out in Kenya to assess social acceptance and scope of scaling up of UDDTs. The results showed that almost all respondents among UDDT users and non-users have overcome social and cultural barriers to accept UDDTs. Most UDDT users were applying UDDT products as fertilizers on their farms. It is recommended to promote coordination and networking of local community based organizations in order to replicate UDDTs.

INTRODUCTION
Forty percent (40%) of the global population does not have access to improved sanitation (WHO 2010) and over 90% of untreated sewage is discharged to the environment polluting surface water bodies such as rivers, lakes and coastal areas (Langergraber & Muellegger 2005). Traditional methods of defecation such as pit latrines and open defecation are still dominantly used in many low income countries where pit latrines follow the ‘drop and store’ principal (Esrey et al. 2001) and open defecation follows the ‘drop to forget’ principal. These traditional methods of defecation have high potential to pollute the environment by spreading pathogens.

Most of the low income countries in sub-Saharan Africa will not be able to reach the sanitation target in the Millennium Development Goals (MDGs), which is to halve the number of people without access to adequate sanitation by 2015 (Zurbrugg & Tilley 2009). For reducing the number of people without access to safe drinking water and sanitation to achieve the MDGs, new ideas and concepts on sustainable and economically feasible sanitation systems rather than expensive conventional technologies are needed (Werner et al. 2009).

Urine diversion dehydration toilets (UDDTs) might be one of the alternatives and affordable options to solve the sanitation problems because they facilitate the closing of the nutrient cycle between sanitation and agriculture. UDDTs not only comprise toilets but also enable recovery of resources such as natural fertilizers from human feces and urine for use in agriculture, thus helping to preserve soil fertility, assure food security, minimize water pollution and reduce waterborne diseases. To some degree, UDDTs have the prospect to protect water pollution caused by pathogens (SuSanA 2011) and they can be one of the components of on-site treatment of human excreta and urine (Wegelin-Schuringa 2000).
In both urban and rural areas of low income countries in the world, UDDTs are being introduced as one of the sustainable sanitation technologies through various types of projects targeting individual households, the public (shared UDDTs) and schools with the help of international, national, and local organizations. High level of awareness about this technology among the users, professionals and policy makers will help to increase its social acceptance and to replicate it among the non-users (WaterAid 2008).

In Africa, UDDTs have been introduced in many countries since the late 1990s and there have been mixed results regarding their acceptance and scaling up (Langer-graber & Muellegger 2005; WSP 2005, 2009; Heppleston 2009; Tumwebaze & Niwagaba 2011). In eastern and Southern Africa, South Africa and Uganda are reported to be the countries having the largest coverages of UDDTs in terms of the number of people served, which is estimated to be 200,000–300,000 persons in each of the two countries (Heppleston 2009). Estimates by Heppleston (2009) show that Uganda has the highest proportion of population served by UDDTs (0.79%) in the world, with most of the UDDTs being concentrated in the south-western region of the country. In both South Africa and Uganda, the governments have been strongly supporting the introduction of UDDTs in collaboration with donor agencies and non-governmental organizations (NGOs), and ecological sanitation has been integrated in the national sanitation strategies. For example, in Uganda, the Ten Year National Strategy on Ecological Sanitation (2008–2018) aims to reach 15% ecological sanitation coverage of the total sanitation by 2018. Major challenges facing the spread of UDDTs in Africa include social acceptance, high dependence on subsidies, low rate of utilization of urine and feces in agriculture, and poor maintenance (WSP 2005, 2009; Heppleston 2009).

In Asia, examples of efforts to introduce UDDTs include the case of Nepal where people have set up the first ‘human urine bank’ in the world for improving their farmlands, which had degraded seriously due to excessive use of chemical fertilizers (NGO Forum 2010). On the other hand, Nawab et al. (2006) showed that rural Muslim communities in Pakistan were opposed to UDDTs in favor of flush toilets. For the studied community, UDDTs are an age-old fashion, backwards and a matter of taboo, while flush toilets were considered prestigious and desirable. The rural communities studied by Nawab et al. (2006) were interested in constructing improved sanitation consisting of flush toilets with an underground sewerage system. The study gave importance to cultural preferences in the planning of low-cost sanitation systems.

Kenya, where the current study was conducted, is one of the low income countries in the world having 50% poverty level (CIA 2000). On average only 42% of the population in Kenya is using improved sanitation facilities (UNICEF 2010). The conventional sewage treatment system is very expensive and not affordable for the poor people in Kenya. Therefore, as an alternative collection option for human excreta, UDDTs started being introduced in Kenya in the last ten years or so, on a pilot scale. It is considered that there is still low awareness about UDDTs among Kenyan people and those covered by the pilot projects area are still learning the new technology. Limited awareness and socio-cultural barriers on handling human waste have been identified as some of the key constraints to large-scale adaptation of UDDTs (Drangert 2004). Scaling up and social acceptance of the UDDTs will therefore be great challenges for rural and peri-urban areas in Kenya where UDDTs are being introduced.

Under the above background, the objective of this study was to assess the social acceptance of UDDTs in one of the pioneer rural areas in Kenya where UDDTs have been introduced. The study also tried to assess the scope of scaling up of UDDTs in the Kenyan setting. Social, cultural and economic aspects regarding the replication and acceptability of the UDDTs were also considered.

**METHODOLOGY**

**Study area**

The study area is located in Rachuonyo District of Nyanza Province in Kenya in the Lake Victoria Basin (Figure 1). It was selected because it is one of the first areas in Kenya where UDDTs have been introduced since 2004. The area provided sufficient numbers of samples for both UDDT users and non-users. Besides, the area was reported to have achieved a high rate of social acceptance of UDDTs and therefore it was considered that it would provide useful lessons to learn.
Three villages in two sub-locations were selected for the study purpose (Table 1). Several UDDT projects funded by Adventist Development and Relief Agency (ADRA) Finland, Canadian International Development Agency (CIDA), European Union and German International Cooperation Agency (EU-GIZ) and Swedish International Development Cooperation Agency (Sida) have been implemented in the study area since 2004. OSIE-NALA (Friends of Lake Victoria), a local NGO, is one of the key local organizations that have been involved in implementation and promotion of the UDDT projects in the area.

Survey methods

Both primary and secondary data were collected in this study. Primary data were collected through a structured questionnaire survey and key informant interviews from August to September 2010. Some participatory rural appraisal (PRA) tools such as focus group discussion (FGD) and mass gathering, among others, were applied in this regard. Detailed methods employed in the study are described below.

Questionnaire survey

A preliminary survey was conducted before the actual survey (in August and September 2010) to develop a questionnaire for both UDDT users and non-users. The questionnaires were finalized based on the findings of the preliminary survey. The questionnaire was very detailed, consisting of more than 50 questions. The questionnaire was implemented by local persons who were trained in advance to familiarize themselves with the questionnaire contents and survey instructions. A total of 245 samples consisting of 118 UDDT users and 127 non-users were selected.

Table 1 | Samples collected in questionnaire survey

<table>
<thead>
<tr>
<th>Location</th>
<th>Sub-location</th>
<th>Village</th>
<th>UDDT users</th>
<th>UDDT non-users</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Kanyalu</td>
<td>Kowuor West</td>
<td>Ouya</td>
<td>86</td>
<td>62</td>
<td>245</td>
</tr>
<tr>
<td>Kagweno Oriang</td>
<td>Kagweno Oriang West</td>
<td>Katuola and Waumi</td>
<td>32</td>
<td>65</td>
<td></td>
</tr>
</tbody>
</table>
non-users were sampled in the structured questionnaire survey. The 118 samples of users represented all (100%) UDDT users in the study area. As for non-users, a random sampling method was applied. Table 1 shows sub-location- and village-wise number of samples collected in the questionnaire survey.

Key informant interview

Several key informant interviews were conducted with local members of Women Groups, community leaders, religious leaders and local government officers. Selected questions from the questionnaire were asked to the key informants during the interviews. All key informant interviews were executed by the authors themselves and notes were recorded manually.

Focus group discussion (FGD)

Six FGDs (three with UDDT users and three with non-users) were facilitated by the authors. A comfortable venue and standard duration (less than two hours) of FGDs were considered to facilitate spontaneous discussion to collect useful qualitative data, ideas and thoughts. Data and information obtained from the FGDs helped to support the interpretation and discussion of results of the questionnaire survey.

Mass gathering

Mass gatherings (big group discussions with 50–60 people) with all levels of community people (comprising both UDDT users and non-users) were executed to assess the general opinions of the people about the UDDTs and also to validate, with participation of the people, quantitative and qualitative data and information collected through the questionnaire survey, key informant interviews, and FGDs. Three mass gatherings were executed by the authors in the three study villages.

In addition, relevant secondary data were obtained from concerned Government Agencies, NGOs, and published and unpublished literature.

RESULTS AND DISCUSSION

Community initiatives and role of Women Groups

Wegelin-Schuringa (2000) identified participatory approaches as effective methods in awareness raising and mobilization of communities for ecological sanitation. Participatory approaches can stimulate people to think about their own priorities versus sanitation and help them decide on a selection of technologies. In the current study, results from key informant interviews, FGDs and other informal interviews showed that local Women Groups in the study area played a leading role in community development activities, including promotion of UDDTs and creation of awareness about sanitation issues through community led participatory approaches. There are three active Women Groups in the study area, namely, Kanyonje, Tang’lwet and Nyochoo Women Groups. The origin of the Women Groups dates back to 1993 when around 10 women made the first group (Kanyonje Women Group) with the objective of ensuring access to safe drinking water and a clean environment in the study area. Currently the total number of members of the three Women Groups is around 80. The local Women Groups are actively involved in various activities for the betterment of the environment in the study area.

The Women Groups have been conducting surveys on various issues in the study area since 2004 when UDDTs were first introduced in the area. Among their findings is that up to 75% of the more than 100 children surveyed each year in the study area were affected by different waterborne diseases such as schistosomiasis, typhoid, amoebiasis, dysentery and cholera (Figures 2 and 3). As shown in Figures 2 and 3, there has been a decreasing trend of...
occurrence of waterborne diseases from the time UDDTs were installed in the two sub-locations of the study area. Another finding by the Women Groups on the condition of pit latrines in the study area is that from 2004 to 2009, of a total of 661 pit latrines surveyed, 471 (71%) had collapsed. The high rate of collapse of pit latrines is attributed to the coarse sandy soil structure in the study area. The above two findings are some of the major driving forces that led the Women Groups to think about solutions to the sanitation problem and to be actively involved in the promotion of UDDTs in the study area.

Toilet situation

The questionnaire survey results showed that 53% of the respondents among non-users of UDDTs have pit latrines. The remaining 47% do not have toilets so they use open defecation in bushes, river banks or open spaces. Open defecation negatively impacts on the hygiene of the study area and pollutes surface and ground water. It is also highly possible that pit latrines too pollute both surface and groundwater because of the sandy soil structure that allows easy seepage and the shallow water table in the study area. On the other hand, if UDDTs are properly managed and the urine and feces are fully treated, they do not have these disadvantages even during heavy rains or floods.

Social acceptance of UDDTs

As shown in Figure 4, almost all (99%) UDDT users think that UDDTs are more comfortable to use than their previous toilets (pit latrines and open defecation). On the other hand, 80% of the non-users were not satisfied with their current toilets (Figure 5) due to, among others, bad smell, high rate of infestation with flies and high frequency of collapse of pit latrines. In addition, 97% of the non-users wanted to construct UDDTs and were willing to contribute labor, materials and money towards the construction. Most users (91%) did not face any major difficulties to maintain their UDDTs. The majority of the respondents (85%) among the users of UDDTs have a lot of knowledge about UDDTs and they have learned about UDDTs from various sources such as community activities, friends, newspapers, radio, magazines, schools and so on. On the other hand, only few respondents (13%) among the non-users of UDDTs have a lot of knowledge on UDDTs. Tumwebaze & Niwagaba (2011) reported similar findings in their study on ecological sanitation in Uganda where about 60% of respondents were positive about using UDDTs. They also reported several modes of learning about UDDTs such as radio and community meetings.

Almost all respondents faced the social barrier of handling urine and feces when UDDTs were first introduced in
the study area. However, this barrier has largely been overcome as evidenced by a majority of respondents among both users and non-users who indicated that they are comfortable handling urine and feces. This was achieved through awareness raising, training and education undertaken by the local Women Groups and implementing organizations of the UDDT projects. As a result many people in the study area know about safe handling and use of urine and feces.

All (100%) respondents among both users and non-users have their own farms. Most of the UDDT users (90%) are spontaneously using the urine and treated feces on their farms as natural fertilizer. Furthermore, as shown in Figures 6 and 7, 88 and 67% of users and non-users, respectively, are willing to buy UDDT products (urine and feces) from others. The difference between users and non-users may be due to relatively less knowledge about the products of UDDTs among non-users.

The above results suggest that, generally, UDDTs are socially accepted by both users and non-users in the study area. Although there were some misconceptions before installation of UDDTs, later many people overcame those barriers. The barriers include the belief that applying ash on feces causes stomach-ache, that those who use UDDTs are at high risk of being bewitched, or that it is unacceptable (taboo) to touch the feces of daughters- or sons-in-law. With awareness raising and public education conducted by local Women Groups and NGOs, the social and cultural barriers were largely overcome.

**Replication of UDDTs**

In a study on diffusion of ecological sanitation toilets in seven countries (China, India, Mexico, Mozambique, Nepal, South Africa and Uganda) Heppleston (2009) observed that most users perceived the major advantages of UDDTs as long lasting, cleanliness, absence of odor and flies, and lower maintenance costs. On the other hand, benefits of providing natural fertilizer or improvement in health condition were not prominent. In the current study, all (100%) users and 94% of non-users think UDDTs are good for Kenya and are even interested in encouraging community members to install them. The factors cited are that UDDTs provide natural fertilizers, are long lasting compared with pit latrines, do not pollute water, and improve health status. Results also show that 97% of the users and 66% of the non-users thought that health and hygiene conditions have improved after installation of UDDTs in the study area. All these factors point to the high potential for replication of UDDTs in the study area and beyond.

Cost is one of the important considerations for future replication of UDDTs. In the study area, the average construction cost of a double chamber UDDT is Kenya shillings (KES) 60,000 [United States dollars (USD) 744 at the time of the survey] while the average construction cost of a pit latrine is KES 12,000 (USD 148). As for the UDDTs, the projects contributed about 70% of the total cost while the beneficiaries contributed the remaining 30%.

The average income of UDDT users is around KES 12,000/month (USD 148/month). Somehow they can afford the 30% beneficiary contribution of the construction cost which is about KES 18,000 (USD 223) and is mainly in kind in form of unskilled labor and some locally available
materials such as stones, gravel, sand and timber. About the construction cost, 53% of the respondents among users thought that it was cheap, 34% thought it was affordable and the remaining 13% thought it was expensive. However, all of them were of the opinion that there is need to reduce the current construction cost to make UDDTs affordable to low income earners. On the other hand, the average income of non-users is about KES 4,000/month (USD 50/month) which means that the construction cost of UDDTs is comparatively high and not affordable for them. Similar findings were reported by Tumwebaze and Niwagaba (2011) who observed that in Uganda where the cost of a UDDT ranged from USD 244-731, respondents with higher incomes were more likely to have UDDTs than those with lower incomes. In the current study, the UDDTs installed are of very high quality and are constructed to last for a long time. With some modifications in the construction methods and more use of locally available materials, it is possible to reduce the construction cost.

One of the major findings regarding financial issues was that the local community people in the study area depend on external financial contribution by donors to install UDDTs. This is consistent with observations by several other studies on UDDTs in Africa where it is noted that almost all implemented projects heavily depend on subsidies (WSP 2005, 2009; Heppleston 2009; Tumwebaze & Niwagaba 2011). The UDDT projects surveyed in the current study are part of the national sanitation program which is funded by donors who contribute about 70% of the total cost while the beneficiaries contribute the remaining 30%. A key challenge is whether UDDTs can be replicated in the study area and other areas without donor funding. At the time of the survey, all UDDTs constructed in the study area had received donor funding and none had so far been constructed with self support of the community. This dependence on external financing might be a great challenge for donors or implementing agencies to the replication of UDDTs in the study area. Alternative financing mechanisms such as involvement of microfinance institutions, local community fundraising initiatives, and involvement of local influential groups, among others, would be helpful in the replication of UDDTs in the study area and beyond.

**CONCLUSION**

Although there were some social barriers before installation of UDDTs in the study area such as fecophobia, belief that sprinkling ash on feces causes stomach trouble, and social taboos such as touching daughter- or son-in-law’s feces, these barriers have been largely overcome through awareness raising, training and education activities undertaken by local Women Groups and NGOs. The rate of acceptance of UDDTs in the study area was very high due to high incidences of collapse of pit latrines and high rates of waterborne diseases which led the people to easily accept UDDTs as a better alternative.

**RECOMMENDATION**

UDDTs have been accepted widely in the study area despite challenges or social barriers initially faced. The major factors contributing to the wide acceptance are considered to be the loose sandy soil type in the study area that makes pit latrines less attractive due to frequent collapse, high frequency of occurrence of waterborne diseases, the advantages of UDDTs over pit latrines and open defecation (especially lack of smell and lack of infestation with flies) and the prominent role played by local Women Groups and NGOs. These factors may not be applicable to all areas in Kenya or in other low income countries in the world. The driving forces leading to acceptance and replicability of UDDTs may vary depending on location, geographical settings, and religious and cultural beliefs, among others. There is therefore a need to properly assess the driving forces while introducing UDDTs to an area.

Although the initial cost of UDDTs may be higher than that of pit latrines, in the long run UDDT users can get added benefits such as fertilizers, low maintenance cost, comfort, and prevention of water pollution. For more acceptance and replication of UDDTs in rural and peri-urban areas in Kenya, there is a need to promote coordination and networking of local community based organizations for sharing of lessons and experiences. Alternative financial mechanisms such as involvement of microfinance institutions, local community fundraising activities, and involvement of local influential groups,
among others, should be explored for the replication of UDDTs in the study area and beyond. This will go a long way to overcome many of the challenges facing introduction of UDDTs such as cultural and social barriers, training for proper maintenance, and creation of markets for UDDT products.

ACKNOWLEDGEMENTS

This study was supported by various partner organizations in Japan and Kenya. In particular the help received from OSIENALA and local Women Groups in the study area is acknowledged.

REFERENCES


First received 29 August 2011; accepted in revised form 22 February 2012