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Evaluation of composting latrines

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REPOSITORY RECORD

Banister, S., J. Burke, P. Sekeitto, H. Mvulane, C. Bakainaga, and M. Freeman. 2019. “Evaluation of Composting Latrines”. figshare. https://hdl.handle.net/2134/29201.

23rd WEDC Conference Durban, South Africa, 1997

WATER AND SANITATION FOR ALL: PARTNERSHIPS AND INNOVATIONS

Evaluation of composting latrines

S. Banister, et al., South Africa

THIS PAPER PRESENTS the interim findings of a sanitation research project, undertaken in an urban informal settlement, with the support of the Greater Johannesburg Transitional Metropolitan Council (GJMC) and the Water Research Commission. A locally developed comporting latrine called the "Enviro Loo" is being evaluated in terms of health impacts and technical performance. Thirty comporting latrines were installed in the Elias Motswaledi settlement, south of Johannesburg, for trial use and monitoring over a period of one year. Results of the monitoring and the acceptability of these latrines as compared to a control group of thirty communal chemical latrine users, is discussed.

Background

Sanitation systems other than waterborne have received increasing attention in many developing countries due to water scarcity, economic and financial constraints, and a backlog of inadequate provision of water and sanitation to growing informal communities.

A composting latrine system viz. the Enviro Loo (Figure 1), has recently been developed in South Africa. The unit consists of a plastic container, 1800mm long x 600mm wide x 1300mm deep, which is placed in an excavated hole in the ground. Inside the container are a main plastic grid onto which the faecal matter falls, below which are a number of inter-linked grids sloping to the back of the container where a collection box is stored for the final composted product. Other parts of the system include a porcelain toilet bowl and a plastic mock cistern specially designed to be used without water, an agitator rod (connected to a handle on the mock cistern and a paddle in the container which is designed to break up the faecal material on the main grid), air inlet ducts, an air extractor duct, a windmaster unit and an inspection manhole. A superstructure is normally built over the latrine although the latrine can be incorporated into the dwelling itself.

Figure 1

The developers of the unit report generally odour-free and trouble-free operation and social acceptance of the latrine. While similar dry sanitation systems have been used successfully overseas, and several of the locally developed composting latrines have Shady been installed and used in locations around Soup Africa, no large scale independent trial and assessment of these latrines has been carried out in this region to date.

Project aims

The major aims of the project were to monitor the health aspects and technical performance, and assess the acceptability of the composting latrine over a period of twelve months.

Project initiation

The Elias Mofswaledi informal settlement

The selected informal settlement is situated in Soweto and was established in 1994 following occupation of land owned by the GJTMC. At the time when the project was initiated, there were approximately 1 300 stands in the settlement, their allocation having being carried out through local community structures. The GJTMC has since provided about 16 standpipes and 125 communal chemical latrines to the settlement.

Installation

Thirty composting latrines were installed on individual stands in the settlement. Installation commenced in March 1996 and included excavation of a hole for the container, placement of the container, casting of a floor slab, building of the superstructure and installation of the toilet bowl,

mock cistern, air ducts and windmaster unit. Installation was completed during April 1996 at a cost of US$1150 (R5 177) per latrine including labour, materials and supervision. All labour used in the installation of the latrines was sourced from the community. Two important components of the project have been the involvement, from the outset, of the participating community and the provision of a full back-up and maintenance service for the latrines by the GJTMC.

Project implementation

User education

After installation of the composting latrines, a meeting was held with residents partaking in the trial to officially hand over the latrines and to educate them regarding their use. Important user guidelines include:

- not placing water or inorganic waste into the latrine;
- the use of specially provided organic cleaner (which will not kill the bacteria responsible for breaking down the faecal matter in the latrine) rather than the use of chemical cleaners (which will kill the bacteria);
- the preferable use of toilet paper as an anal cleansing material;
- the occasional addition of compost to facilitate the composting process.

User and health education regarding the composting latrines has been continued throughout the trial

Monitoring

The World Health Organisation defines health as " a state of complete physical, mental and social well- being, not merely the absence of disease and infirmity." Therefore, to monitor and evaluate the health impact of the composting latrines, the identification of health aspects which are both measurable and related to sanitation was considered essential.

The following factors were thus monitored:

- the incidence of acute diarrhoeal disease, since it is widely accepted as a reliable indicator of the quality and adequacy of sanitation facilities in a community;
- the incidence of acute respiratory disease, as it could be a major confounding factor;
- the presence of sanitation related nuisances specifically foul smell and flies;
- user knowledge concerning the functioning of the composting latrine;
- level of satisfaction, including perceived safety, regarding the composting latrine as a sanitation facility;
- baseline data on the demographic and socio-economic characteristics of the participating households in the trial to facilitate understanding and meaningful interpretation of the findings.

Monitoring began in May 1996 and has been carried out fortnightly using a questionnaire requesting feedback from users on the characteristics of the participating households, their health status and perceptions regarding the performance of the composting latrine. The thirty households using the composting latrine constituted the study group. For each study household, a control household was selected from the communal chemical toilet users.

In addition to the questionnaire, technical aspects have also been monitored via field observations made by the study team regarding the physical condition and performance of the composting latrines. Observations of the contents of the containers have been made when the inspection manhole covers have been opened in order to record ambient air temperatures inside the containers. Relevant meteorological data has also been obtained from nearby weather stations.

Preliminary results

Baseline household characteristics

Analysis of the baseline characteristics of the study and control groups showed the following:

- there were more children under the age of five in the control group;
- the study group comprised predominately adults, who were employed and Xhosa speaking;
- composting latrines were perceived as a very safe sanitation facility;
- general knowledge regarding the sanitation facility used was initially higher amongst the chemical toilet users.

Incidence of acute diarrhoeal disease

Acute diarrhocal disease was defined as the presence of three or more loose stools in 24 hours. The incidence of acute diarrhoea was consistently higher among the control group as compared to the study group. Furthermore, trends in the incidence of acute diarrhoea! disease show a gradual increase among the control and a gradual decrease among the study group. Both study and control groups reported increased diarrhoea episodes in early summer, probably due to changes in weather conditions. Approximately 73 per cent of diarrhoea disease episodes among the study group and 55 per cent among the control group were cleared without treatment or with self medication, indicating that most episodes were of mild degree. The study did not include microbiological evaluation of the causative agents.

Incidence of acute respiratory disease

The observed pattern of acute respiratory diseases resembles that observed for acuate diarrhoea diseases in both the study and control groups. However, a higher proportion of episodes, 46 per cent in the study group and 59 per cent in the control group, required consultation with professional health workers indicating that the episodes were probably of a moderate to severe degree.

Complaints of flies and foul smell

Complaints in respect of flies and foul smell were more numerous from the contol group than the study group. Towards the early summer period, however, complaints concerning both flies and smell increased appreciably amongst the householders using composting latrines. This latter trend requires further analysis, but could be attributed to the problems experienced with the agitator rod mechanism in the composting latrines, as well as changes in the weather. Data collected so far is not adequate to permit examination of any association between complaints about flies and/or foul smell and the occurrence of diarrhoeal illnesses. It is hoped such analysis will be possible at the end of the study.

Specific knowledge on how the composting latrine functions

Knowledge regarding the correct usage of the composting latrines particularly with respect to the proper use and application of organic cleaner and compost, showed a steady improvement throughout the study period. The initial low level of general knowledge among the study group is probably due to the fact that the study group had not yet consolidated their understanding of how the composting latrine functions.

Safety

A greater proportion of the control group perceived the chemical latrines as unsafe in comparison to the study group who generally perceived the composting latrines as safe.

Technical aspects

The agitator rod mechanism failed to work after a period of time in many of the composting latrines which may have accounted for the increase in complaints of flies and smells amongst the composting latrine users. A new and improved agitator rod system was retrofitted to all the composting latrines after six months, after which the incidence of flies and odours decreased. The physical integrity of the composting latrines has remained generally sound although the rainy summer season has highlighted that stormwater control requires careful consideration during installation. A high usage of toilet paper as an anal cleansing material amongst both the study and control groups has been recorded. The particularly high levels amongst the study group may be partially attributed to the user education these households received regarding the use of the composting latrines, but indicates households may also be purchasing their own supplies of toilet paper in addition to those routinely supplied to all households by the GJTMC.

Towards the end of the study period, the composting process was observed as still in its infancy as faecal matter in the composting toilets remained largely confined to the upper grid of the container, more or less in its original state. Ambient air temperatures inside the container remained below 20°C during the winter period and even dropped below 1 0°C during the night and early morning. More rapid biological breakdown of the faecal matter could be expected to occur during the summer season when temperatures in the container were generally greater than 20°C. The composting process will continue to be assessed at regular intervals by visual inspection, as well as laboratory analysis of samples collected from the container.

Interim conclusions

The above findings remain preliminary pending further monitoring and evaluation of the study results taking into account significant differences in the baseline characteristics of the study and control groups. The project has, however, promoted product development by highlighting design weaknesses in the composting latrine, namely the agitator rod.

The waterless composting latrine has the potential to be an alternative and affordable sanitation system in a water scarce country such as South Africa, although the need for user education appears crucial, especially if the latrine is to succeed in areas where there is little local authority support.

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Acknowledgements

The project team would like to acknowledge the Water Research Commission for their financial support, the Elias Motswaledi community for their co-operation and participation in this project, and the staff of the Epidemiology and Health Information Systems of the GJTMC who administered the questionnaire.

S. BANISTER, South Africa.
J. BURKE, South Africa.
P. SEKEITTO, South Africa.
H. MVULANE, South Africa.
C. BAKAINAGA, South Africa.
M. FREEMAN, South Africa.