



Uganda: Use of Effective microorganism (EMO) for stench elimination and sludge reduction in latrines

Uganda

Case Study on Use of Effective microorganism (EMO) for stench elimination and sludge reduction in latrines

ABSTRACT

In Uganda disposal of human excreta has been done since the 1950s through the use of pit latrines. In the 1990s, the pit latrine designs were modified to remove fly nuisance and smell through the use of what is known as ventilated improved pit (VIP) latrines. While the VIP works well on a single stance pit latrine, its effectiveness ceases when a pit latrine accommodates several stances. Each pit in the stance acts as a “vent” that emits odours to the users and attracts flies. There are several ways of upgrading the pit latrine, to reduce the odours and flies such as the use of septic tanks or twin pit pour flush composting latrines. These options are relatively expensive and sometimes difficult to apply on an existing old pit latrine.

One of the ways to deal with the problems of odours, rapid filling up and flies is the application of a solution known as *effective microorganisms* (EMO) in latrines. The concept of EMO was developed by Professor Dr. Teruo Higa, University of Ryukyus, Okinawa, Japan in 1980. EMO are not-genetically-engineered (non-genetic modification organism), not pathogenic, not harmful and not chemically synthesized. The EMO technology involves growing, applying, managing and re-establishing high populations of the beneficial microorganisms in an environment or system. EMO are of different species. Some are lactic acid bacteria that have powerful sterilising properties. They suppress harmful micro-organisms and encourage quick breakdown of organic substances. It is a natural and organic technology that has been found to be useful in numerous ways.

BACKGROUND

The pit latrines remain not only a temporary solution to human excreta management but are associated with foul smell that makes it uncomfortable for users. In some crowded households and schools, the users have to remove sweaters and sometimes blouses/shirts before entering the latrine to avoid having the odors cling to their clothes which can incite teasing and stigmatization.

Secondly, the rate of school pit latrines filling up is faster and most of the districts in Uganda have run out of land/space for the construction of new latrines. Most of the districts have attempted to support construction of drainable latrines in line with the Uganda Ministry of Education and Sports (MoES) policy but this is still faced with financial and environmental issues relating to the high cost of emptying (sometimes requires use of motorised cesspool emptier) and environmentally un-friendly sludge discharge methods (sometimes the emptied sludge is dumped anywhere the operator deems convenient, to avoid paying the costs of discharging into National Water and Sewerage Corporation wastewater stabilization ponds). Due to cost considerations, some of the schools have resorted to manual pit emptying that involves physical handling of fresh sludge laden with pathogens, foul smell, and pose a public health risk. While in some high density populated districts, such as Kabale, Kisoro (due to space limitations) latrines are located far away from motorable trucks making it impossible to use the services of the cesspool emptier.

The experiment was therefore conducted to find alternative options of reducing the frequency of pit emptying. One such option was to apply EMO technology that is believed to increase the “*life*” of such pit latrines. UNICEF supported the Government of Uganda to undertake field testing of the EMO in 40 schools in Kabale district between July and September 2012 to ascertain whether EMO technology reduces smell and sludge volume in pit latrines.

STRATEGY & IMPLEMENTATION

Materials and methods

A total of 53 schools were identified at random out of which 40 were included in the experiment while 13 were identified as controls to the experiment. The EMO application was undertaken in 40 primary schools from 2nd to 9th July 2012, while non-chlorinated water was applied in the 13 control schools. Measurements were taken to determine stench distance and sludge levels prior to and after EMO and plain water application in experimental and controlled latrines respectively.

Stench measurement was done by reading and recording the distance between the point, where smell from the latrine was first detected to the latrine facility (using metre ruler and sisal string). Whilst for sludge measurement, stone or brick tied to sisal string was used to lower into the pit until it reached the sludge. Then measurements were later taken of the length of the string that was dropped into the pit.

After the measurements, the EMO solution was mixed with non-chlorinated water. About 20 litres of non-chlorinated water were poured into the pit latrine to reduce the urine acidity of the sludge before EMO was applied. The mixture of EMO and water were poured into the pit latrine with active participation of school children.

PROGRESS & RESULTS

The EMO Technology application team that included UNICEF staff and/or ministry or district officers conducted the tests. Within 10 minutes of the EMO application, the EMO Technology application team listened to comments and testimonies from the schools sanitation clubs (2 teachers and students) who actively participated in the study including monitoring progress of stench removal and sludge reduction. The observations began on the same day of the application, weekly by the school team and UNICEF, and by the Central and district team after 3 weeks of the EMO application into the pit latrines.

Approximately 3 weeks, after the EMO application, each of the participating schools (both those utilizing EMO and the 13 control schools) were visited between 29th July and 4th August 2012. The focal point teachers and children and where available the School Management Committees (SMCs) were asked to briefly describe what was happening in the latrines where EMO was applied. Measurements were taken to ascertain the remaining part of the pit and stench distance. All the schools provided feedback, based on what they had seen, heard from users, and community members that pass near the latrines.

The findings were presented to Kabale District authorities to enable them provide input into the report. The action of EMO was positive. The EMO are part of the family of microorganisms that live in soil and their actions improve 4 elements of the soil within the pit of the latrine:

- Permeability,
- Porosity
- Aggregation of soil particles
- Water infiltration

One of the questions raised was whether the EMO actions in a pit latrine can destabilise the pit walls leading to collapsing of the pit and latrine superstructure. These new soil characteristics acquired as a result of EMO application actually strengthen the pit walls. Pit latrine collapsing is not expected unless externally induced; e.g. by surface run off/storm water.

CHALLENGES

The main challenge of the experiment was keeping the teachers and school children interested in regular monitoring of the performance of EMO and adhering to the requirement of the experiment, particularly school that had to collect non-chlorinated water from a far distance.

During EMO application

The EMO technology application attracted a number of on-lookers. The reaction before the EMO application was varied and it ranged from latrine stench-induced spitting, reducing the amount of smell entering the nose through using “*cloth masks*” or using fingers to close the nose or to keeping a fairly “safe” distance from the latrines. During the application, the stench reduced substantially and disappeared after approximately 10 minutes of the EMO application. The number of persons spitting reduced and crowds of persons who had kept a safer distance, drew closer to the latrines and provided the feedback.

Within 10 minutes of the EMO application

When the application started, in most latrines, the stench reduced substantially. It remained a matter of the time lag between the EMO application and the presence of some wind. The EMO application team heard some of the following remarks from on-lookers.

- “The smell is gone. One can now eat a potato from the latrine” un-named male pupil in Kitanga Primary school.
- “I don’t need to remove my sweater anymore. Where did this miracle solution come from?” unnamed female pupil in Kiyora Primary school.
- “It really works. I can take more time in the latrine. When can you give it to us to use in our homes?” Chairperson, SMC, Rwesasi Primary, School
- “Eeeeh, you people, things have worked” Head teacher, Uganda Martyrs, Muhanga Primary School

Box 1, Personal Testimonies from latrine users at the time of EMO application

Two weeks after the EM application

All schools that gave feedback registered reduced stench in the latrines where EMO technology was applied.

In all the 13 control schools, where EMO was not applied, there was no difference in stench distance during the period.

- “The pit latrine stench has cleared” Head teacher, Muchahi (St. Paul).
- “These things are working. No smell detected”. Focal point teacher, Nyabushabi Primary School.
- “The situation is improving. No smell detected any longer. Thank you for the project”. Female focal point teacher, Muyumbu Primary School.
- “We thank you very much for favouring us. I was looking for money to empty the latrines. The stuff is reducing. No more smell” Mwebesa Frank of Kyanamira Primary School
- “Really, there is great improvement. Smell completely out. Latrine floor dry faster after cleaning. No flies. Sludge going down. Only water seen in latrine” Focal point teacher, Mwisi Primary School

Box 2, Personal Testimonies from teachers 2 weeks after the EMO application into the latrines

LESSONS LEARNED

Within three weeks of EMO application into the 40 school pit latrines, all school records (logbooks) reported a tangible reduction in the sludge. The results for the best performing latrines in 16 primary schools found that approximately 26.05 metres of the pit space -(equivalent to 87 feet) were recovered. This translates into 6 pit latrines (\$27,185 UGX 70 million Ugandan Shilling). The study therefore, contributed to saving UGX \$18,058 (That is to say \$27,185 – \$9,126 (investment cost by UNICEF) worth of pit latrine space for use by children in the 3rd term of 2012.)

The latrines used by boys were more likely to achieve substantial sludge reduction than those used by girls. This was probably because the girls use the pit latrine for both urination and defecation. Urine tends to increase uric acid that is toxic to EMO and that affects the performance of the microorganisms.

Similarly, relatively more sludge reduction was found in latrines where fresh plant-based anal cleansing materials were used compared to paper due to the moisture content in plant-based materials and the ratio of nitrogen to carbon vs. paper based materials.

Associated benefits

The focal point teachers reported other benefits of EM technology application in latrine operation and maintenance.

Cleaning the latrine daily/regularly

Each of the participating schools was given an extra 10 litres of EM for use as a cleaning “*detergent*” with water. All schools reported cleaning the latrines daily and as a result, latrines are dry and have minimal flies while maggots have been reported to disappear.

During the EMO application exercise, all categories of stakeholders in school sanitation were represented and were asking numerous questions that were indicative of *resurrected* interest in latrines.

No need to remove sweaters and blouses

The impact of this is that children no longer need to remove sweaters and blouses before entering the latrine (as was the case before).

Reduction in fly population

The regular cleaning of the latrine floors and the correct “positioning” of excreta directly into the pit has contributed to the reduction of flies that used to hover in latrines. This in turn has made the latrines relatively more comfortable to use. Similarly, other crawling insects, such as maggots and cockroaches were not seen at the time of the monitoring visit. These crawling insects passively carry human excreta to food or food utensils posing serious health risks.

No need to use the bush for defecation

Some children reported that it was no longer necessary to use the bush (open defecation) to avoid the odorous latrines and the subsequent teasing by other pupils after use.

NEXT STEPS

The study appears to have cultivated a new social norm that contributes to motivating teachers and pupils – to keep the latrines clean. The SMCs have increased interest in school latrines too compared to before EMO applications, previously the SMCs were only focused on water management and not hygiene issues. The EMO technology team in Kabale will now use the opportunity to improve hand washing with a detergent after visiting the toilet and before and after eating meals at schools and homes as part of the continued UNICEF- Government of Uganda WASH programme.

© **United Nations Children’s Fund (UNICEF) January 2013**

Disclaimer: This case study is not edited to official publication standards and is intended exclusively for sharing within UNICEF. Statements do not imply or constitute official opinions or policy positions of either the United Nations or UNICEF.

Acknowledgements: This case study is a collaborative effort among the UNICEF Uganda Country Office and the Internal Communication Section (Division of Communication).

Authors/Editors¹: Edward Bwengye-Kahororo, Programme Specialist (Uganda); Prakash Lamsal, WASH Specialist (Uganda); Edward Ying Jr., Senior Communication Assistant (NYHQ); and Arissa Sidoti, Communication Specialist (NYHQ).

For further information on ICON case studies, please contact:

Sharad Sapra
Representative, UNICEF Uganda (Kampala)
Email: ssapra@unicef.org

Or

Abhijit Shanker
Chief, Internal Communication Section (DOC New York)
Email: ashanker@unicef.org

¹ Contributors: Ms. Santa Ojok, Principal Education Officer and Ms. Elizabeth Mutumba, Senior Education Officer Ministry of Education and Sports, Emmanuel Okrut, Environmental Health Officer, Ministry of Water and Environment, Justine Otai, Senior Health Environmentalist, Ministry of Health. Kabale District: Nizeyimana Emmanuel, District Education Officer, Bizimana Michael, Assit. District Water Officer, and Oliva Namanya, Assit. District Health Officer. UNICEF WASH Innovations: John Bosco Kimuli Sempala, WASH Specialist, Schools Stephen Wandera, WASH Officer and Madul Sam, WASH Officer,