FAMILIAL ECO-SANITATION

INTRODUCING THE FOSSA ALTERNA LATRINE TO SUBSISTANT FARMERS

A WATER AND SANITATION PROJECT EXPERIENCE IN RURAL MALAWI

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Project Officer, April 2010.

1 Context

1.1 The project

The Eco-San[1] latrine implementation described in this paper was experienced by the Inter Aide Chiseka WASH[2] project in Lilongwe district, Central Region, Malawi. This project started in the Central Region in 1992 but Eco-San was introduced in 2006. It targets rural poor communities in a development context. The main objective of the project is to reduce water born diseases. The activities implemented are:

- Sanitation through latrine construction: 1000 subsidized slabs per year
- Shallow wells construction: 25 per year
- Hygiene behavior change: using the PHAST[3] methodology within about 35 communities a year.

The project focuses on the durability through a solid participatory approach and an important in kind participation: labour and locally found material.

1.2 Sanitation

In the area targeted by the project, sanitation is relatively poor. On average, 50% of the households have traditional latrines (without this project). A traditional latrine consist in a pit of two to three meters deep covered with logs and soil, with an infrastructure made of mud and a thatched roof.

[1] Eco-San: Ecological Sanitation, or dry latrine.
[2] WASH : Water, Sanitation And Hygiene.
[3] PHAST: Participatory Hygiene And Sanitation Transformation.

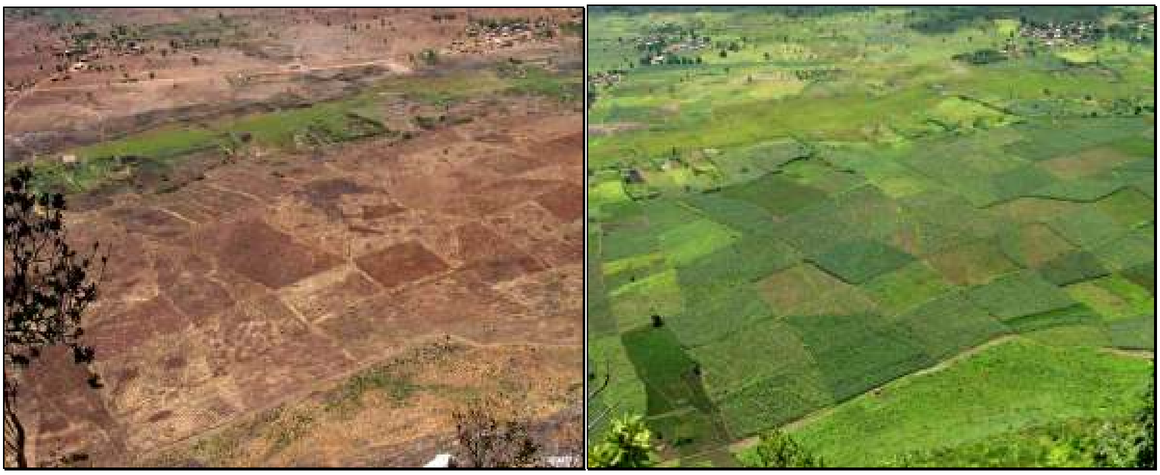
Since 2003, this project provides large round slabs (1,2 meters diameter) for free. They are used to cover traditional pits. In addition in 2006, the Eco-San was introduced for a period of four years. Finally, the tools from CLTS[4] approach were introduced mid-2009.

The Eco-San is included in the national sanitation policy of Malawi as it can help to address sanitation, food security and environmental issues.

1.3 Food security and environmental context

The population consists mostly of subsistent farmers. Their staple crop is maize. Food security is a main issue: until recently, Malawian regularly suffered from food shortages. The government is addressing the problem through an extensive program of chemical fertilizer subsidies. Since then the situation dramatically improved: this program is very effective and the population highly appreciate it. However, they are concerns about its financial sustainability.

Environmental issues are increasingly worrying. The population density is quite high – more than 200 inhabitant / Km2 in the targeted area. Deforestation is now dramatic. Same, from a long term perspective, soil erosion is a slow onset disaster. Finally, Malawi is periodically experiencing rainfall shortage and, according to farmers, is already impacted by the climate change.



Above: same view from the top of Bunda Hill in dry season and rainy season. Low lands remain green are year round. They are cultivated during the dry season and are flooded during rainy season. See how villages are close to this low land: there, the water table is very shallow. Observe also the level of deforestation.

[4] CLTS: Community Led Total Sanitation. An approach based on shame and discussed, targeting the eradication of all kind of open defecation at community level, without any kind of subsidies.

2 Technically speaking

2.1 Choosing the Fossa-Alterna

Ecological Sanitation was introduced to try an integrated approach: sanitation and manure, the later was believed to be a powerful fertilizer. However, the main concern was – and still is – the sanitary risk. Though the main focus of the project is sanitation and the main concern in the technical choice is to avoid sanitary risk, the possible beneficial ecological impact is considered as an interesting and positive "consequence".

In this project the familial Fossa-Alterna was chosen because it is the one commonly implemented by other actors in Malawi such as Water Aid, so it must have proven to be adapted. In particular:

- It is simple enough to be build by the targeted population.
- Apart from the slab, it is made of commonly found building material.
- It converts faeces in manure.

2.2 Proper use

One handful of soil and one handful of ash should be added after each use. This is mandatory for a proper transformation process of faeces into manure. Indeed:

- Soil contains microorganisms – especially fungus – which starts the process.
- Ash enhances the process by balancing the chemical balance (and enriches the future manure).
- Overall, soil and ash together avoid compaction of the pit matter. This allows its oxygenation (aerobic), which is mandatory for a fast process.

In addition, ash and soil systematically dries and sanitizes the faeces. Dryness is important for oxygenation and it helps eliminating pathogens. If properly done, there is no smell and no insect: no flies and no cockroaches. Eliminating such important vectors of disease is excellent sanitation-wise.

2.3 Disadvantages

2.3.1 Sanitary risks

The main risk of the Fossa-Alterna resides in the handling of human manure. If un-matured, the manure may still contain a high concentration of pathogenic micro-organisms. This may be due to the following reasons:

- *Lack of ash or soil:* without proper daily care, the faeces take up to five years to transform into safe manure. If there is small or flies, the situation is risky.
- *Excess of moist in the pit*: the moist brought by the urine is far enough. More water is risky.
- *Early manure harvesting*: manure should never be harvested before six months. However, early harvesting may occur because of some farming calendar constraints. It may also occur because the less the pit matter is matured, the more powerful a

fertilizer it is. Nevertheless, if prematurely harvested, the high concentration of pathogen elements in the manure makes its harvesting and its utilization risky.

- *Conflicting messages*: introducing Eco-Sanitation and, therefore the spreading over of human manure, can contradict hygiene messages. In other projects, this introduced such confusion in the mind of the people that some took short-cuts: they started to defecate again in the open fields.

In this project, these sanitary risks are addressed essentially through strong sensitization and follow-up.

2.3.2 Other problems

Bricks are required for the lining of the pits. This hinders the Fossa-Alterna construction. Indeed, it represents an important participation for the people. Some people may loose their motivation, or are simply unable achieve this requirement. This is an issue which needs a strong follow-up from the project. However, there are some technical alternative such as using broken bricks or choosing the Arborloo (see chapter "*5-2- The Arborloo*").

Anyway, to reinforce the pits, it is important to make them long-lasting enough, and specific advantages can be found in it (see chapter "*4- Unexpected advantages*").

2.4 Advantages

Manure: The manure production is the main advantage of the Fossa-Alterna. Clearly, this is the reason why people are interested in it. Manure can be used for food production or to be sold (see chapter "*3-3- The human manure*").

Long lasting: Traditional pit-latrines often collapse during the rainy season. With the Fossa-Alterna, the pit is lined and is not flooded. So it doesn't collapse easily. As pits are regularly emptied, they are re-used. So the Fossa-Alterna can last long. In contrast, traditional pits usually collapse within five years after being dug. If slabs are installed on it, they can fall in the pit.

Sanitation: By reducing the insect vector, the Eco-San is excellent sanitary-wise.

Groundwater protection: with its shallow and dry pits, the Eco-San is a good solution to address groundwater bacterial pollution from pit latrines (see chapter "*4-1- Shallow water table*").

No cover: to avoid insect vectors, covering the pit hole is important with traditional latrine. The point is to have people doing it is very difficult. With Eco-San, this problem doesn't exist: there are no insects.

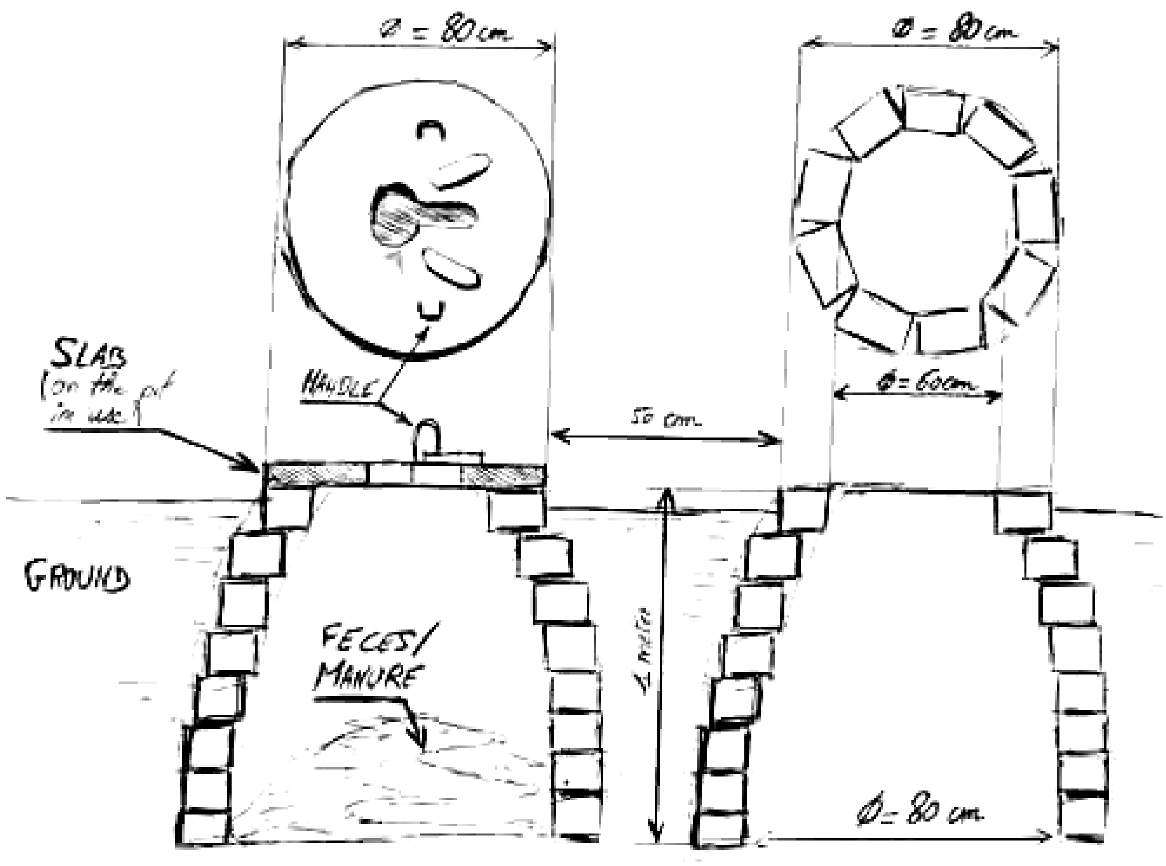
Solid waste disposal: thin vegetal like kitchen waste and leaves can be thrown in the pit. This is good for the process, and for eliminating vegetal solid wastes.

2.5 Pit construction details

The family Fossa-Alterna latrine is made of two pits lined with burnt bricks. This requires about 200 to 400 bricks per latrine according to the brick size. Bricks are sealed with soil. The permeability of the sealing is important as it helps to get rid of the moist.

Apart from the top layers which can easily be maintained, this kind of pit is very strong. However in hard soil, it is possible to reduce the number of brick by lining only the top of the pit. Bricks also allow a dome shape. This shape makes the top diameter smaller, so the slab diameter is smaller as well: it is cheaper and easy to slide it from one pit to another.

The dimensions of the pits are important. The volume needs to be enough for six months of utilization (for a standard Malawian family, 4,5 persons). Nevertheless in this project some pits got full prematurely. So, to reduce the risk of premature filling, the pits depth was increased to 1,2 meter. Adapting the dimensions of the pit to exceptional family size can be relevant.



Above: top view and cross section of the 2 pits.

3 Motivating people

3.1 Initial scepticism

From the people's perspective, the Fossa-Alterna is a strange latrine. In addition, it is difficult to build. The only reason why they may accept to build one is the possibility of getting free manure. This is why in this project, although the main objective is sanitation, the mobilization focuses on manure advantages.

In Malawi[5], farmers usually already know about compost (decayed plant matters) and manure (fertilizer made from animal excrements). Usually they don't know much about human manure. They are merely used to plant banana trees where a traditional latrine collapsed, and to hear messages about Eco-Sanitation on the radio from time to time. However, this is a good start.

So in this project, the implementation of the Eco-Sanitation component was at first considered as introducing a new and strange type of latrine. And indeed: most of the people were very sceptical about it, including the project team. This is very common. To overcome this initial scepticism, the project had to adopt some kind of marketing approach consisting in demonstrations, repeated messages and tract distributions.

Demonstrations should be extensive. The most important for subsistent farmers to be convinced about the benefits of the Fossa-Alterna is to visually show them *how good the human manure is* on their crops. To reach this stage of crops growing with human manure, the project needs to go through the long process of constructing latrines in a demonstration village – six months –, of producing manure – about one year – and of growing crops.

But even before that, the first people who need to be convinced are the team members: they are the ones doing the job on the field. The first step is to have them visiting an already existing Eco-Sanitation project. However, this is far from being enough: after this visit, the team needs to make its own experience and to build its technical capacity. The second step is in the office: there, the team should build – and use – a Fossa-Alterna latrine, and cultivate a garden utilizing manure brought from the field visit. Still, this is not enough. The real field experience starts with communities: with a demonstration village and public demonstration gardens.

In this project, this took two years. Then the Fossa-Alterna activity was able to scaled-up. All this requires a long commitment from the management. This also needs to set-up priorities between two conflicting objectives: pure sanitation and the Eco-Sanitation introduction, in other words between the total number of latrines built and the number of Eco-San latrines built.

Above, the sign at the entrance of the demonstration village: "come to see the manure latrine demonstration village Fanuwelo"

[5] In the project catchment area, Muslims, who are highly resistant to human manure, are very few.

3.2 Demonstration village

To have a demonstration village is a mandatory step. The village itself and the way the Fossa-Alterna are constructed there, should both be representative to convince future visitors. However, its size should be small enough to be manageable. Ideally the whole village should adopt the Fossa-Alterna. Geographically, it should also be easily central, and easily accessible. According to the size of the catchment area and the number of visits expected, the creation of several demonstration villages should be attempted, especially considering that many might fail.

Above: visitors observing closely human manure.

Once the demonstration village is using the Fossa-Alterna, other communities can be proposed a visit to it. Representatives like elders and committee members (gender balanced) can be transported there. A symbolic fee can be requested to avoid unmotivated visit. This fee should be paid directly to the hosts as compensation: indeed, when the activity scales up, the demonstration village may receive several visits a week. This is a real job.

The visit can start with an introduction meeting but the most important is the field observation (latrines and demonstration garden). A lot of questions are raised. However, the best is to let the hosts lead the visit and farmers speak to farmers. Back to their community, the visitors will share their experience with their own community.

In this project, although visitors often arrived sceptical, they were always amazed by what they discovered – especially through the observation of the demonstration gardens.

3.3 Demonstration garden

3.3.1 Objective

Same as the demonstration village, a public demonstration garden is mandatory. The first objective is to show to the people the impact of the human manure on different crops. There should be at least one: in the demonstration village. However, to target a large public, others can also be located on the side of some busy roads. Specific animation with tract distribution can be organized on-site, on market days for example. Finally, demonstration gardens also convince the demonstration village inhabitants – and the team members as well!

3.3.2 Implementation

For each crop, the pattern is as follows:

- Each crop is grown on three different plots.
- Only the fertilization changes between these plots: on the first one there is no fertilization, on the second one there is human manure, on the third one there is chemical fertilizer.

- No other factors than fertilization should change. So, the soil fertility of these three plots must be rigorously the same. In particular, they should not be located too close from a road or a house, and should have had the same culture the previous year.

These gardens should be representative of the local agricultural practices in respect of chemical fertilizer utilization and kind of crops grown. This eases the task and makes the demonstration clearer and easier to understand for everybody.

Small gardens are simple to manage. They are suitable to the dry season because easy to water. They are made of small beds of about one by two meters. Different kind of vegetables can be grown. Small gardens are important tools to convince visitors all year round.

Large garden are suitable for large crops like maize and tobacco. They should be cultivated during the rainy season. It is possible to measure and compare the yields of each plot if a meticulous methodology is used. So, in addition of being very realistic, large demonstration gardens can also be experimental gardens. This is very valuable for the project management as it provides field experiences and result-based information.

3.4 The human manure

3.4.1 Experimental gardens

Objective

Human manure quality vary according to the users' diet, how they use the latrine, and also with the climate. Similarly, soil and cultivation practices vary. So it is interesting to have local knowledge about human manure characteristics and utilization. However, despite the proximity of the excellent Bunda National Agricultural College, located within the catchment area of the project, this local knowledge is very basic.

As far as we know, the ratio of manure to be applied is 1 handful per maize seed, or per 25cm for smaller plants. It is applied while seeding and is mixed with the soil – diluted. However in practice, many questions are raised. In the demonstration village, farmers are building-up their experience years after years, experimenting different combinations.

The short-term objective of experimental gardens is to improve the local knowledge about the human manure as fertilizer. The very distant objective is to be able to propose human manure utilization protocols for different crops. However, the later requires agricultural professionals and chemical analyses.

In this project, experimental gardens are large demonstration gardens cultivated meticulously and where everything is measured. Each garden was made of three plots, each plot measuring around 10 meters by 10 meters. The following crops were cultivated:

- maize (the staple food), three gardens
- tobacco (a major cash crop), one garden
- beans and soya (commonly grown leguminous / nitrogen fixing), one garden each.

Results are given below.

Results[6]

Maize:

- The best germination and growth (after four weeks) were both obtained with human manure.
- In one garden, an attack of termites occurred: it especially targeted the plot where human manure was applied (25% destroyed).
- Yield[7]: +42% with human manure, compared to +148% with chemical fertilizers.

Tobacco:

- Yields of the first and second harvests: +125% with human manure, compared to +193% with chemical fertilizers.
- A temporary drought occurred and a disease occurred. The plot without any fertilizer was the most affected, the one with chemical fertilizer the less, and the one with human manure in between.
- Yields of the third and fourth harvests: +125% with human manure, compared to +718% with chemical fertilizers.
- All harvests together: +125% with human manure, +586% with chemical fertilizer

Beans and soya: no significant impact.

Above : two pictures assembled to show the three different plots of the tobacco garden. From left to right : no fertilization, human manure and chemical fertilizer.

[6] Results are given for only information. Indeed, the project didn't have proper skills to produce reliable data. See annexes "Experimental Gardens Results" for more details.
[7] Yields are given in percentage relatively to the yield of the plots without any fertilizer. To avoid side effects, two meters of margins were not included in the measurements.

3.4.2 Manure quantity

Volume produced

The experience gained through the demonstration village confirmed the literature's information: the quantity of manure each family (4,5 persons) can expect to produce is roughly 600 Kg a year.

Quantity needed

The measurements were done when cultivating the experimental gardens: at a ratio of one cup per 25cm, 80 Kg of manure is applied over a ridge of 70 meters.

3.4.3 Pathogens

Human manure samples were collected and analysed by the laboratory of Bunda Agriculture College. Pathogens were detected in some samples (see annexe "*Chemical analyses, Bunda College*" for more details).

This seems to confirm previous findings of analysis done on samples collected in Salima[8]: the pathogens concentration is significantly reduced after 6 months and is close to zero after 9 months (in Malawian climate).

3.4.4 Lessons learned

Lack of urea

First growth is excellent both for maize and tobacco grow with human manure: it is as good as with chemical fertilizer. However the harvest is quite poor. This may be due to the lack of urea in human manure. Indeed, although urea concentration is high in urine, it is quickly gasified. So, nitrogen concentration is low in manure[9]. In conclusion, a better yield could be obtained by combining chemical urea with human manure. An alternative would be to combine maize with beans which are nitrogen fixers[10].

Quantity

The quantity of human manure a family can produce is very small compared to its need: on a maize field, is can only be applied on few percent of the minimum area a family need to cultivate to subsist.

Termite

It seems that termites are attracted by manure. This have to be considered as such attacks can be an important side effect of human manure utilization.

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[8] Research done by Mathews Daniel Tsirizeni in March 2004, on a similar Fossa-Alterna project in Salima, Malawi. However, Salima is located nearby the lakeshore, so there is a different climate.

[9] Urine collection can also be a solution. However, some experiments were done on this project. The conclusion is that it is not realistic. Indeed, urine needs to be stocked before use for sanitary reason, which is problematic. In addition, introducing human manure is already a very challenging objective.

[10] In this project, maize and beans were combined in one of the experimental garden. The yield was low but this may because the beans contracted some diseases. So, it is worth to renew the experiment.

Drought resistance

Manure rehabilitates the soil, and having a healthy soil increases the plants resistance to drought. However, the low resistance to drought of the tobacco fertilized with manure contradictis this statement. More exactly, this observation confirms that soil rehabilitation takes time: according to the literature review, soil rehabilitation can take up to seven years – provided that manure is applied each year.

Manure market

The inhabitants of the demonstration village are usually applying their human manure in their own field. However, when they are in need of cash, the also sell it to the neighbouring villages: one bag of 80Kg is sold around 3US$. This means a lot about the value of this manure as fertilizer. It also means that human manure production can be financially profitable. In some extent, it could become an income generating activity. Considering the relatively small inputs required for a fossa-alterna construction and its durability, such activity is economically interesting.

Utilization and sanitary risks

Manure is commonly used for maize and vegetable production – like tomato. Maize takes long to mature, then it is dried, and finally it is always cooked before consumption. So pathogens may have totally disappeared by then. The case of tomato is more worrying because it is harvested more quickly, eaten fresh, and can even be eaten raw.

The problem is that some pathogens remain after six months. This means it can be transmitted through the tomato. So ideally, manure should be harvested after nine months. However this is conflicting with the agricultural calendar. Indeed, sowing occurs twice a year: at the beginning of the rainy season – in November – and at the beginning of the dry season which is six months later – in May. So, subsistent farmers are naturally harvesting and applying manure twice a year: according to the rain cycle.

3.5 Communicating

3.5.1 The basics

Communication is the key tool to make people both interested by the fossa-alterna and using it properly. Demonstration villages and demonstrations gardens are very powerful for that. To be convincing, both the team and the demonstration village inhabitants should also have a good theoretical and practical knowledge about the fossa-alterna construction, its use and its manure. However, to be effective, messages need to be spread extensively and repeatedly.

3.5.2 Tract

Tracts have the advantage to be carried and shared within communities and then within families: children, more often literate than adults, will read it. Even within an oral culture, written papers remain and can be understood easily if written in local language. The tract can explain about the human manure, the latrine construction and how to get one. More important, it should spread key messages.
Key messages should be extensively spread and their understanding and application should be checked. They are:
"To have safe manure:

- Both pits should remain dry, so you need a good roof.
- Adding ash and soil after each use is mandatory for destroying pathogens. It also avoids flies and smell. If there are flies, it means you need to apply more.
- Manure should never be harvested before six to eight months after using the pit.
- After touching manure, always wash hand with soap or ash."

Tract can be distributed:

- During the demonstration village visit
- On the demonstration and experimental garden sites, combined with participatory observation
- During the latrine construction follow-up
- Once the latrine is in use: while doing the post construction follow-up.

3.6 Post construction follow-up

Follow-up is mandatory during the latrine constructions (including slab installation). This represents an important work-load for the project. At this stage the project is more in contact with men. The follow-up should continue once the latrines are in use, at household level and for each and every fossa-alterna built. Key messages can be spread extensively, in a practical manner, and the proper use of the latrines physically checked. It is especially important because at this stage women are more often met. It is also a good way to know how the people appropriate their latrine. Repeat messages, share advices and experience, give the tract. In this project, each and every family with a fossa-alterna was visited at least once. Most of them were visited two to three times.

Lesson learnt
The impact of this follow-up is excellent as good progress were observed. People appreciate it because they perceive it as a support.
As men are involved in the latrine construction, women usually don't know about the fossa-alterna proper utilization before they start using it. So, it is always interesting to meet women during this follow-up: then women are responsible of their daily use.
People usually don't wait six months before harvesting manure for the first time. Indeed, they stick to the agricultural calendar. However, the timing is much better the second time.
Long term problem of installation and bad utilization only occur in communities where slab were cast without enough prior participation.

3.7 In kind participation

3.7.1 Objective

Participation is a key element to develop ownership. This is important if slabs are subsidized. Indeed, once cast, the people still need to install it and to finalize the construction. This is often an issue with normal latrine. So, it is even more important with the fossa-alterna: here participation is also to enhance the willingness to utilize it and maintain it properly.

3.7.2 Starting

As said before, the introduction is slow and difficult. An important step is the setting-up of one or several demonstration villages. In these first villages, the participation should as much as possible be similar to the one planned in the long term. Indeed, in the future, visitors need to perceive the participation which is requested as fair and realistic. This is especially true for the locally found material: the future demonstration village should not be a perfect one but a realistic one.

However, a proper participation may be difficult to get at that stage. Indeed, the inhabitants are not yet convinced about the Fossa-Alterna. They will be convinced only when seeing with their own eyes how good their own manure on their own crops is. If such is the case, pride and prestige are useful devices. Indeed, communities are motivated by the perspective of having an official inauguration, a sign at the entrance of their village, numerous visitors, and to become famous. However, they should not expect financial advantage from all this: it would spoil the whole future process of experience sharing.

In the future demonstration villages, the two pits should be ready before casting slabs. Digging is a small job, but providing bricks is often an investment. However, the people should to it.

3.7.3 Scaling-up

Participation should increase as soon as possible and simultaneously in all the communities targeted. Reaching a high level of participation may seem too challenging at the beginning of the fossa-alterna introduction. However, once the inhabitants of the demonstration village start cultivating with their own human manure, it becomes very much possible: indeed, visitors really see the financial advantage in it. All this mainly depends on the strength of the mobilization.

Lining

It can start with the lining construction. This is a real job: it request training and takes at least half a day per latrine. It can be done by "volunteers" previously trained. They will ask for compensation to the latrine owner, so, to avoid future problems, a clear agreement should be established between the volunteers and their communities before their training. Working through volunteers has several advantages:

- It develops a skill within the community. This is important for both sustainability and replicability.
- It increases the participation.

- The community can work at its own pace.
- It relieves the project of an important work-load: it just requires follow-up.

Roof.

Slab installation and proper superstructure often takes time to be made after the slab casting. The problem is the pits need to remain dry for a process of faeces decomposition – and to avoid pit collapsing. So, shelter and roof can be requested before casting, especially during the rainy season.

And also:

- To stimulate a new community, it is good to show some concrete realisation. To do so, it is good to come and cast one or two slabs as soon as possible. It might not seem cost-effective but it really speeds-up the other households.
- The future proper use of the latrine is important. So, before getting their slab, beneficiaries can have to "pass an exam" – answering a test – to check their knowledge about it.

4 Unexpected advantages

4.1 Shallow water-table

4.1.1 Ground water pollution

Bacterial pollution of the groundwater is commonly due to latrines. In this project, this problem often occurs when the water-table is less than two meters deep. The groundwater floods the traditional pits and carries the pollution as far as 200 meters down the latrines. It happens during the rainy season: when the morbidity rate is at its highest.

The fossa-alterna latrine is a good solution to address this problem: because its pit is shallow. So in risky areas, this project sensitizes the inhabitants on ground water pollution. In addition, the condition for a well construction is a 100% coverage of fossa-alterna upward the future well. Another option would be to drill boreholes.

In some areas, the water-table rises at even less than 1,2 meter deep: there, it would flood a normal fossa-alterna pit. The raised fossa-alterna is a good solution.

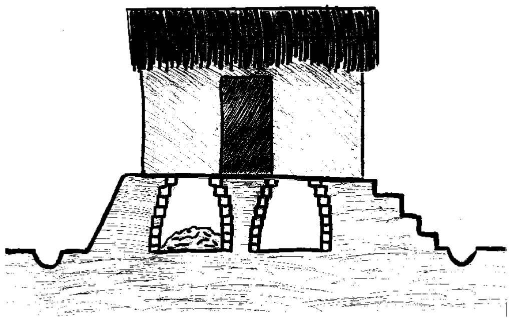
4.1.2 Raised fossa-alterna

If the pit of the fossa-alterna is flooded, the manure may still have a high pathogen concentration after six months, and the pits may collapse prematurely. So in risky area, people are first asked how shallow the water-table is during the rainy season: they usually know it very well. Then they are asked to not dig deeper. To compensate the volume lost, the top of the lining is built higher than the ground level. The lining shape doesn't change. Finally, some

Left : raised lining recently completed. Above : raised lining with compacted soil and slab.

soil is compacted around the two linings and the superstructure can be built on it. At the extreme extent, where the water-table can be close to the surface – it can become run-off – it is possible not to dig at all.

In this project, several villages located in swampy areas successfully constructed numerous raised fossa-alterna.



Above: poster explaining how a Fossa-Alterna can be raised to be protected from the run-off.

4.2 Collapsing ground

Where the ground is weak – for example sandy – traditional pits are collapsing prematurely. Consequently, in such areas, the latrine coverage is exceptionally low – down to 15%. Same as in shallow water-table areas, the fossa-alterna is a good technical solution thanks to the lining of its pit.

4.3 Long term construction

The pits of the fossa-alterna are long-lasting because they are reinforced and never flooded – and emptied twice a year. So, the whole latrine is a long term construction. If properly maintained (more especially protected from the rain) their owners may use it for decades. In comparison, traditional pits usually collapse within five years after being dug. Consequently, the owners of the fossa-alterna build superstructure of excellent quality: they make a long-term investment. In addition, as there are neither flies nor smell, they are proud of it.

Above : good quality of the superstructure. This Fossa-Alterna is slightly raised.

4.4 Mosquito control

Traditional pit latrines get flooded during the rainy season. So, it may participate in the proliferation of some mosquitoes, particularly of the culex pipiens which breed in polluted water. Such mosquitoes transmit major diseases like the filariasis.

The Fossa-Alterna, with its dry pits, can help in controlling the mosquito proliferation.

4.5 Lessons learned

On one hand, the fossa-alterna is more difficult to build than a traditional latrine. In the other hand, where the water-table is shallow or the ground weak, the pit lining can turn to be an advantage. In this project, several villages located in swampy or sandy areas successfully constructed numerous raised fossa-alterna. So in both cases, latrine coverage dramatically increased.

Generally speaking and as said before, subsistent farmers want to build a fossa-alterna because it produces free manure. So in this case, the integrated approach makes sanitation more advantageous.

Beneficiaries easily perceive these advantages. As the direct interest of building such latrines is higher, the fossa-alterna can significantly **increase the latrine coverage rate**. This adds to the reduction of important vectors of diseases such as ground-water pollution and insects. These advantages certainly compensate for the risk inherent to the human manure: the remaining pathogens after six months.

So, the fossa-alterna can significantly help to reach the overall objective which is to decrease the diarrheal rate. This comes in addition to the gain in food-security.

5 Ways forward

5.1 The Arborloo

Characteristics

The Arborloo is a temporary eco-san latrine made of only one and very shallow pit (50 to 70 cm deep). This pit is not lined. Same as with the Fossa-Alterna, ash and soil should be added after each use. Once the pit is full – four to six months – the manure is not harvested: a tree is planted. The superstructure, which should be movable, is carried to a new pit.

To build such a latrine is very simple. It can be done only with local materials, so for free. The inconvenient perceived by the people is the space it requires. From the project perspective, the inconvenient is that the construction effort is postponed. If the owners are demobilized when the pits get full, then they may not dig another pit and not even plant a tree.

Nevertheless, the simplicity of the Arborloo makes this latrine very interesting.

Most vulnerables

In this project, the Arborloo was not introduced to avoid subsidies. The objective was to target the most vulnerable: lonely women – female-headed household – and old people. It was a way to give them an opportunity to get a latrine. To provide a slab was also a matter of equity. This pilot activity started too late to allow any post-construction follow-up, however results were promising: several Arborloo were constructed within few weeks.

Annexes

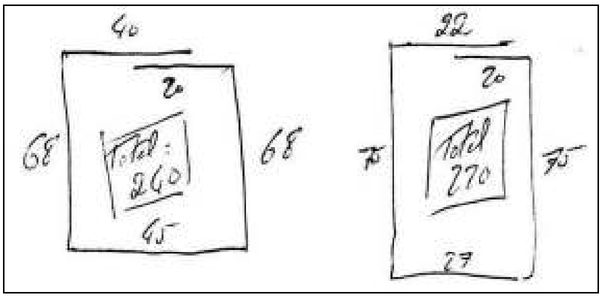
Pictures of a lining construction

Iron frame for slab construction

The slab, diameter 90cm, is cast with 1/5 bag of cement and 6 meters of iron bars (R6).

The iron frame is made as follow:

	L (cm)	Dimensions (to bend)
Big loop	240	= 20 + 68 + 45 + 68 + 40
Small loop	220	= 20 + 75 + 27 + 75 + 22
2 handles of 70cm	70 x 2	
Total	600	



Drawing of the too loops making the slab iron frame, and their dimensions.


Above: finalized iron frame and moulds just before casting.

Chemical analyses,

Sample No	Sample Name	pH	% OC	% OM	% N	P ppm	Bacteria Type	Bacteria Reaction
1	Lackson Top	7.9	1.9	3.2	0.058	111		
2	Lackson Middle	7.4	2.5	4.3	0.069	138		
3	Lackson Bottom	7.8	2.0	3.4	0.074	181		
4	Robert top	7.7	1.6	2.8	0.050	111		
5	Robert Middle	8.8	1.7	2.9	0.054	205		
6	Robert Bottom	8.5	2.6	4.5	0.068	225		
7	K. Zindikireni Top	9.4	3.1	5.3	0.100	183		
8	K.Zindikireni Middle	9.7	2.6	4.4	0.112	157		
9	K. Zindikireni Bottom	10.3	1.4	2.4	0.063	138		
10	Dickson Top	8.5	1.5	2.6	0.058	111		
11	Dickson Middle	8.3	2.7	4.7	0.074	125		
12	Dickson Bottom	8.2	3.9	6.7	0.072	132		
13	Yeselani	9.6	2.0	3.5	0.118	269	Sreptococcus	Gram postive
14	Mazanja	9.5	1.2	2.1	0.165	218	Xanthomonas	Gram negative
15	Mandaliza	8.7	1.3	2.3	0.136	340	Sreptococcus	Gram postive
16	Weluzani	8.9	0.9	1.5	0.084	286	Sreptococcus	Gram postive

Contact: Patson Nalivata, Compost Expert, **Bunda Agricultural College**, Malawi

Tract
front and back
in local language (Chichewa)

ZIMBUDZI ZA MANYOWA

DZIWANI IZI

- Izi ndi zimbudzi za zatsopano
- Zimakhala ndi mayenje awiri
- Mayenjewa amawakidwa ndi njerwa
- Mayenje amakhala ozama – 120cm

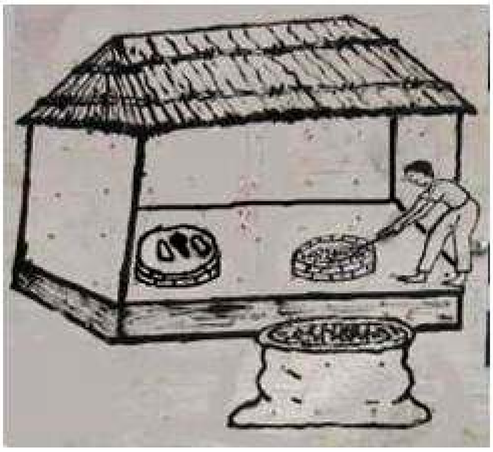
Pa ukhondo ndi manyowa abwino, kuti nthawi zonse mdzenje mukhale mowuma thilani dzanja limodzi la phulusa ndi dzanja limodzi la dothi mukadzithandiza.

KUTI MUKHALENACHO

Bungwe la **INTER AIDE** limapereka masilabu.

- Bwerani ku ofesi ya Inter Aide ku Mitundu, pakati pa bottle store ya Bagdad 1 ndi Bagdad 2
- Imbirani bambo Mdala pa nambala iyi 09 012 417

Pa chithuzichi, munthuyo akufukula manyowa mdzenje loyamba pa kugwilitsa nchito



KUYIPA KWAKE

- **Kuopsya kwa manyowa:** mumadikira miyezi yosachepera 6 kapena 8 musanafukule manyowa. Ngati mufukula miyezi 6 kapena 8 isanakwane zimabweretsa matenda
- **Kusagwiritsa nchito bwino:** ngati simuthira dothi ndi phulusa zimabweretsa vuto la ukhondo komaso manyowa owopsya. Alendo ndi ana amayenera kuphunzitsidwa kagwiritsidwe ntchito kake.
- **Njerwa :** Anthu angalephere kumanga zimbudzizi chifukwa cha njerwa zokwana 400 zazing'ono zing'ono zowakira mayenje awiri.

UBWINO WAKE

- **Mayenje ake:** Ndi mayenje wosavuta kukumba chifukwa sizizama. Mayenje amakhala olimba chifukwa sazama komanso amawakidwa. Ndizabwino kwambiri kumene malo ndi ovuta.
- **Ukhondo wabwino:** Sizimveka fungo, ntchentche, mphutsi chifukwa zimaphedwa ndi phulusa, komanso zimauma ndi dothi. Izi zimalimbikitsa ukhondo
- **Manyowa abwino:** Timapeza manyowa amphavu amene amathilidwa kumbewu. Komanso manyowa amatha kugulitsidwa, mchaka cha 2008 thumba limagulitsidwa pa mtengo wa K350. Banja li modzi limafukula matumba okwana 10 pa chaka
- **Mathilidwe amanyowa:** Mulingo wa dzanja limodzi umathilidwa pa phando lililonse ndikuphatikizidwa ndi dothi. Matumba okwana 10 amathilidwa pa theka la theka la ekala pakadzalidwe ka chimanga chitatuchitatu pa phando. Komaso ndi abwino ku fodya.
- **Dothi:** manyowa amathandiza kubwezeretsa chilengedwe cha dothi

Remark: a total of three tracts can be printed on a A4 paper (both side)

PRATIQUES
Network for the exchange of ideas and methods for development actions
http://www.interaide.org/pratiques/index_english.htm

Urine collection system

The system shown down here was developed by the project to be a cheap as possible, so sustainable. However, introducing human manure is already very challenging. In this project, to add urine collection proved impossible and was quickly abandoned.

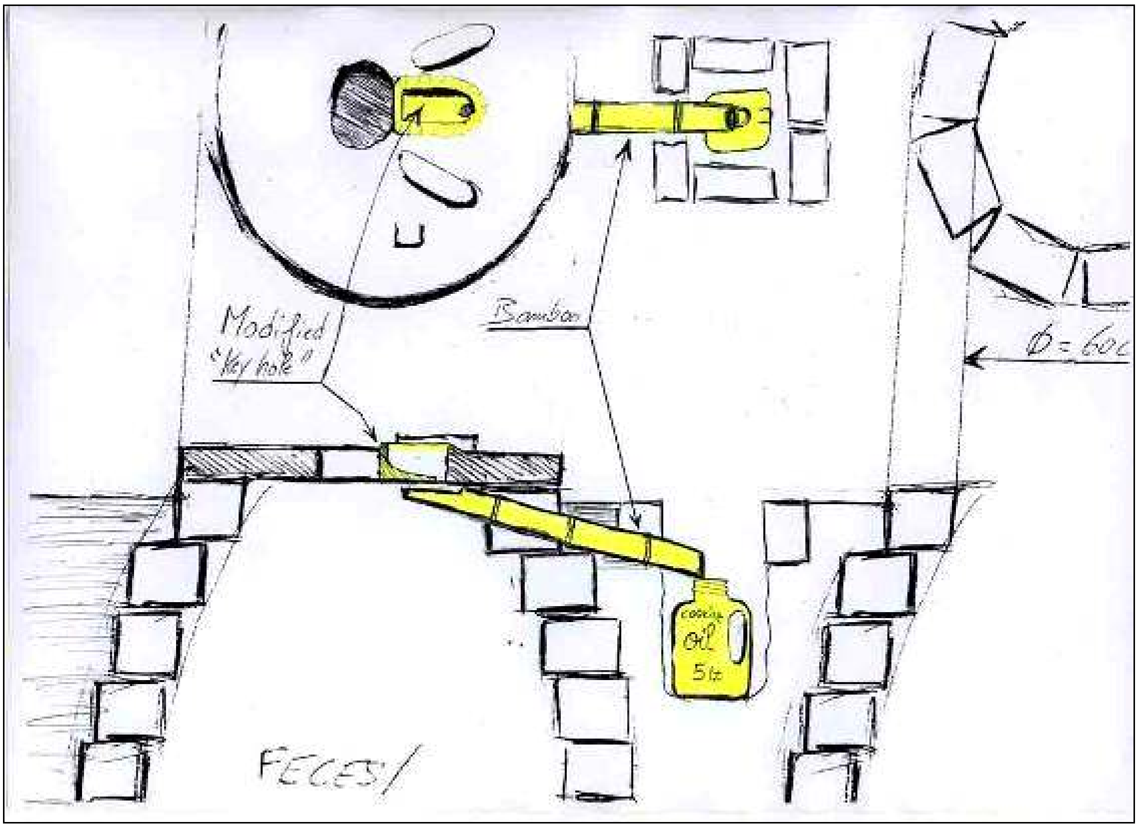


Figure: in yellow, modification to collect urine. Budget: 30 MKw.

Experimental Gardens Results

Culture	Measure Type	Site	Nothing	Manuer	Fertilizer	Comments about manuer	Quantity applied (Kg / Ha)			
									Fertilizer	
							No-thing	Manuer	23-21	Urea
MAIZE*	**GERMINA-TIONS (%)**	Mlale	64%	72%	68%		0	16 289	239	226
		Chingala	59%	90%	63%		0	8 372	124	115
		Police St°	33%	77%	43%		0	14 305	194	194
		Fanuel	77%	68%	72%		0	15 349	262	253
		Averages	**58%**	**77%**	**62%**	Excellent germination	**0**	**13 579**	**205**	**197**
		/ Manuer	**100%**	**132%**	**106%**					
	HEIGHT (cm)	Mlale	13,4	23,8	21,0					
		Chingala	15,6	26,0	19,1					
		Average	**14,5**	**24,9**	**20,0**					
		/ Manuer	**58%**	**100%**	**80%**	Good growth				
	Termites	**% attacked**	**3%**	**25%**	**15%**	Bad attack of termites				
	YIELD (Kg/Ha)	Mlale	1 261	1 883	2 168					
		Chingala	709	1 464	3 100					
		Police St°	1 849	2 352	4 012					
		Fanuel	1 099	1 284	2 913					
		Averages	**1 229**	**1 746**	**3 048**					
		/ Manuer	**0%**	**42%**	**148%**	**Average impact**				
BEANS SOYA	**GERMINA-TIONS (%)**	Chingala	95%	96%	94%		0	12 706	159	0
		Police St°	93%	95%	86%		0	13 737	323	0
		Averages	**94%**	**95%**	**90%**		**0**	**13 222**	**241**	**0**
		/ Manuer	**0%**	**2%**	**-4%**	No impact				
BEANS SOYA	**YIELD (Kg/Ha)** (after 1 month)	Chingala	843	732	769					
		Police St°	2 066	2 301	1 893					
		Average	**1455**	**1516**	**1331**					
		/ Manuer	**0%**	**4%**	**-9%**	**No impact**				
TOBA-CCO**	**GERMINA-TIONS (%)**	Mlale	**97%**	**96%**	**95%**		**0**	**13 260**	**396**	**396**
		/ Manuer	**0%**	**0%**	**-2%**	No impact				
	YIELD (Kg/Ha)	**1st & 2nd harv.**	51	114	148					
		/ Manuer	**0%**	**125%**	**193%**	Good impact				
		3nd & 4th harv.	152	342	1244	Sensitive to drough				
		/ Manuer	**0%**	**125%**	**718%**	Poor impact				
		Total good qu.	203	457	1393					
		/ Manuer	**0%**	**125%**	**586%**	**Poor impact**				
		Total bad quality	30	91	114					
		/ Manuer	**0%**	**200%**	**275%**					

*: Human manure was applied at the time of the seeding, 1 cup per station.
**: Human manure was applied two weeks after transplantation from nursery, 1,5 cups per station.

Experimental garden pictures

Above: preparing carefully the land, applying human manure and seedling soya.

Above: tobacco experimental garden cultivated by a busy road. On each plot, a sign with the details of the work done – especially dates.