



Fig. 1: Project location

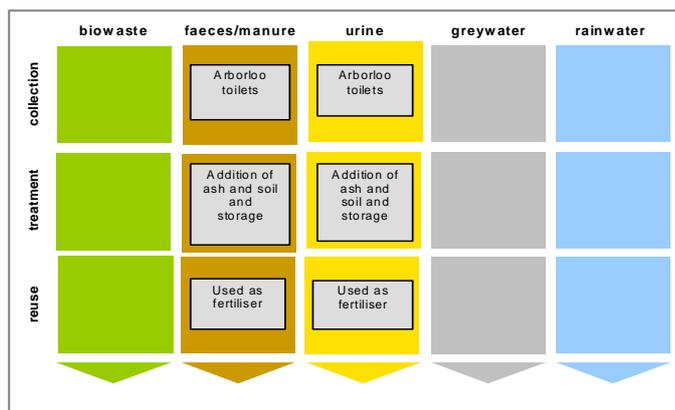


Fig. 2: Applied sanitation components in this project

1 General data

Type of project:

Arborloo as resource-oriented household sanitation

Project period:

October 2006 - March 2010

Project scale:

Number of arborloos constructed: 9

Number of inhabitants covered: 33

Total investment: 347€

Planning institution:

Arba Minch Town Water Supply and Sewerage Enterprise (ARB)

Arba Minch University (AMU)

Executing institution:

Arba Minch Town Water Supply and Sewerage Enterprise (ARB)

Arba Minch University (AMU)

'Idget' construction SME

Supporting agency:

European Union (EU)



The work was carried out within the project ROSA (*Resource-Oriented Sanitation concepts for peri-urban areas in Africa*; Contract No. 037025-GOCE; duration: 1.10.2006 – 31.3.2010), a Specific Target REsearch Project (STREP) funded within the EU 6th Framework Programme, Sub-priority "Global Change and Ecosystems".

2 Objective and motivation of the project

The EU-funded project ROSA (*Resource-Oriented Sanitation concepts for peri-urban areas in Africa*) proposes resource-oriented sanitation concepts as a route to sustainable sanitation and to meet the UN MDGs. The main objective of the project is to develop adaptable, affordable and replicable solutions for sanitation.

Arborloo is one sanitation option which is easy and affordable for many inhabitants of Arba Minch. Such construction would provide improved sanitation in places where there is sufficient space in the compound.

3 Location and conditions

Arba Minch town with a total population of 75,000 and annual growth rate of 4.5% is one of the fast growing towns in Ethiopia. There are wide ranging sanitation problems in the town. And these are expected to grow even worse with rapid population growth. The town does not have pit desludging services forcing residents to dig another pit, or manually desludge the pit, which is an unacceptable practice from the health and hygienic point of view. 10% of the population practice open defecation. There are portions of the town that are congested settlements with rented houses in which land is not available for digging pits and people either share a single latrine, defecate in the open or use flying toilets. A significant portion of the town has loose black cotton soil in which pit collapse is a major problem. Others have rocky ground where digging is very difficult. These problems urge to look for better sanitation options to be implemented in the town.

4 Project history

The ROSA project started in October 2006. On the basis of the overall goal of developing and disseminating "Resource-Oriented Sanitation Concepts in Peri-Urban areas", like Arba Minch town, the project achieved the following aims:

- conducting research including a baseline study and demand assessment on sanitation,
- identifying different sanitation options (involving safe disposal and re-use) through research conducted

by Arba Minch University and other international partners,

- discussing and prioritising feasible options with active involvement of the local administration and community groups,
- undertaking pilot experiments of the different options and disseminating them through practical demonstration,
- providing support in scaling-up implementation in the local community,
- and providing skill training to ensure proper management and operation.

5 Technologies applied

Since its inception in October 2006, the ROSA project has introduced different resource oriented sanitation systems that include three types of toilets, greywater treatment unit, biogas unit and composting schemes. At the moment there are 15 urine-diversion dry toilets (UDDT), 30 Fossa alternas, 9 Arborloos, 9 greywater towers, 1 biogas unit and more than 5 composting schemes.

In this case study Arborloos are focused. There are nine Arborloos in Arba Minch. The total number of users is 33 out of which 15 are male and 18 female.

6 Design information

Arborloo, a single simple pit compost toilet, is made up of 4 parts (Peter Morgan, 2007):

- A pit
- A sheet metal or a half barrel to protect the pit
- A concrete slab
- A toilet house

In this type of toilet urine is not separated from faeces. Three cups of soil and one cup of ash are added after every use. When the Arborloo pit is full, the parts of the toilet are moved to another place, rebuilt and used in the same way again (refer Fig. 3). A thick layer of soil is placed over the filled pit. A young tree is planted in this soil and is watered and cared for (refer Fig. 4). The content will decompose by different biological processes over time and utilized by the planted tree.



Fig. 3: Portable toilet house (source: ROSA Project Arba Minch, 2008)



Fig. 4: Papayas grown on filled Arborloo pit (source: ROSA Project Arba Minch, 2008)

The pits

The pit dug for Arborloo is shallow and has a depth of 1.2m. It is circular and has a diameter of 80cm.

The pit protection

To prevent a pit from collapsing, a sheet metal or a half barrel is used (refer Fig. 5). In stable soils protection was not used.



Fig. 5: Arborloo pit protection (source: ROSA Project Arba Minch, 2008)

The concrete slab

The slab used for the Arborloo is made of concrete and has a dome shape as shown in Fig. 6. The slab has 1m diameter and 5cm thickness. A pile of sand is used to create the dome shape and a 5cm wide sheet of metal is used as a mould. Reinforcement was not used. Three slabs are cast from 50 kg of cement.



Fig. 6: Arborloo slab construction (source: ROSA Project, 2007)

The toilet house

Easily movable shelter is placed on top of the pit. In most of the Arborloos, the material used for the superstructure is a locally available and cheap material called 'karta' which is made of woven bamboo (refer Fig. 7).

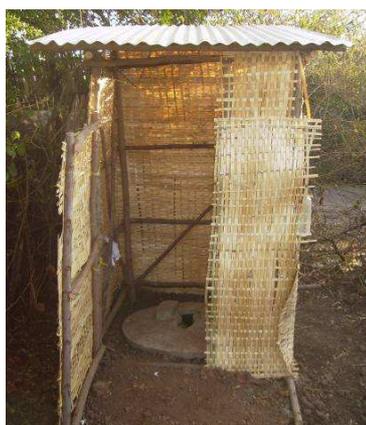


Fig. 7: Typical Arborloo toilet house (source: ROSA Project Arba Minch, 2007)

7 Type and level of reuse

The nutrients from the urine and faecal matter are directly used by the plants which are grown on the filled arborloo pit.

If plants are not grown on the filled arborloo pit, it is possible to allow the pit contents to turn into compost and dig the compost out, 6 to 12 months later, for use on the garden or for fertilizing trees.

8 Further project components

The absence of credit facilities for households which are interested to construct the demonstrated innovative toilet option has constrained efforts for further up-scaling of the implementation. The project has recently worked to generate seed money from other sources with a 50 % grant scheme from the Dutch government and 50 % loan arrangements to facilitate credit access to households who are willing to

construct the toilets. The total amount of money is about one million Euros and this money will be used as a revolving fund.

9 Costs and economics

The details on investment cost for constructing one Arborloo is given in table 1. The total costs include both the material and labor cost.

Table 1: Bill of quantities of one Arborloo

Item no.	Description	Unit	Qty.	Unit price in Birr	Total Amount in Birr	Total Amount in Euro
A. Substructure						
1. Excavation and Earth work						
1.1	Clear the site to remove top soil to an average depth of 20 cm.	m ²	4.00	2.50	10.00	0.54
1.2	Pit excavation in ordinary soil to an average depth of 1.20 m and a radius of 0.3 m.	m ³	0.60	25.00	15.00	0.81
B. Super structure						
2. Concrete Work						
2.1	Provide and fix 1m diameter concrete dome slab	pcs	1.00	86.00	86.00	4.65
3. Carpentry and joinery						
	All structural members and wall materials should be free from harmful defects					
3.1	Eucalyptus diameter of 60 mm	m	28.78	4.00	115.12	6.22
3.2	Eucalyptus diameter of 80 mm	m	6.34	6.00	38.04	2.06
3.3	Eucalyptus diameter of 120 mm	m	9.54	10.00	95.40	5.16
3.4	Woooven Bamboo ('Karta') for wall	m ²	9.90	3.51	34.75	1.88
3.5	Supply and fix 'Karta' Door Size 600x1500 mm ² , including all nailing and accessories.	pcs	1.00	10.00	10.00	0.54
4. Roofing						
4.1	Supply and fix corrugated iron sheet G-32 for roof cover including all nailing and fixing accessories.	m ²	3.80	81.52	309.78	16.74
Total					714.09	38.60

10 Operation and maintenance

The operation and maintenance of the Arborloo toilets is simple and can be carried out by the user. When the Arborloo pit is full, the superstructure parts of the toilet are moved to another place, where a pit needs to be dug and used in the same way again. A thick layer of soil (min. 0.4m) is placed over the filled pit. A young tree is planted in this soil and is watered and cared for. The household may only pay for a daily labourer to dig the new pit and move the slab and the shelter.

11 Practical experience and lessons learnt

- Some users do not like the toilet because of the shallow depth of the pit and may not add ash and soil after defecation fearing that the pit may get filled in short period of time. From observations made up to now, people are interested in toilets which can be used for a long time i.e. about two years and above.
- Getting seedlings (young trees) may be difficult.
- Most of the times there is a chance of not taking care of the plants planted on the filled Arborloo pits and the plants may die and hence the composted excreta may not be utilised.
- No practical experiences with new income generation by arborloos so far.

12 Sustainability assessment and long-term impacts

A basic assessment (Table 2) was carried out to indicate in which of the five sustainability criteria for sanitation (according to the SuSanA Vision Document 1) this project has its strengths and which aspects were not emphasized (weaknesses).

Table 2: Qualitative indication of sustainability of system. A cross in the respective column shows assessment of the relative sustainability of project (+ means: strong point of project; o means: average strength for this aspect and – means: no emphasis on this aspect for this project).

Sustainability criteria	collection and transport			treatment			transport and reuse		
	+	o	-	+	o	-	+	o	-
• health and hygiene		X		X				X	
• environmental and natural resources	X				X		X		
• technology and operation	X			X				X	
• finance and economics	X			X			X		
• socio-cultural and institutional		X			X			X	

Sustainability criteria for sanitation:

Health and hygiene include the risk of exposure to pathogens and hazardous substances and improvement of livelihood achieved by the application of a certain sanitation system.

Environment and natural resources involve the resources needed in the project as well as the degree of recycling and reuse practiced and the effects of these.

Technology and operation relate to the functionality and ease of constructing, operating and monitoring the entire system as well as its robustness and adaptability to existing systems.

Financial and economic issues include the capacity of households and communities to cover the costs for sanitation as well as the benefit, e.g. from fertilizer and the external impact on the economy.

Socio-cultural and institutional aspects refer to the socio-cultural acceptance and appropriateness of the system, perceptions, gender issues and compliance with legal and institutional frameworks.

For details on these criteria, please see the SuSanA Vision document "Towards more sustainable solutions" (www.susana.org).

Health and hygiene: The technology reduces odour and flies.

Environment and natural resources: The excreta collected is used by the seedlings which improves the crop yield, natural resources yield and modify the very warm weather.

Technology and operation: The technology is accepted even by small kids and rural residents who did not use any toilets before. But to construct the whole structure trained local mason is needed.

Financial and economic issues: The toilet owners have farmland and have started reusing excreta. The enhanced fruit yield increases their income.

Socio-cultural and institutional aspects: The toilets are accepted by male and female users. There are no complaints and it is expected that the users will inform their extended families residing in different parts of the zone. The Arba Minch health bureau needs excreta to be treated and safe for handling and as they assured of that, they may accept and institutionalize it. However, this takes time.

With regards to long-term impacts of the project, the main expected impact of the project is improved public health.

13 Available documents and references

1. ROSA AMU, ROSA ARB (2009) Arba Minch Town ROSA Project booklet, Arba Minch, Ethiopia. <http://www2.gtz.de/Dokumente/oe44/ecosan/en-rosa-project-booklet-arba-minch-2009.pdf>
2. Peter Morgan (2007): Toilets That Make Compost: Low-cost, sanitary toilets that produce valuable compost for crops in an African context. EcoSanRes Programme, Stockholm Environment Institute: Stockholm, Sweden.

14 Institutions, organisations and contact persons

Arba Minch Town Water Supply and Sewerage Enterprise
 Wudneh Ayele Shewa (coordinator of ROSA Arba Minch water supply services) and
 Bogale Gelaye Geleta (constructing Engineer and currently manger of the Enterprise)
 P. O. Box 40
 Arba Minch
 Ethiopia
 T: +251-46-8815115
 M: +251-916-825611, +251-911-798018
 E: wudexa@yahoo.com, abiboge@yahoo.com

I: <http://rosa.boku.ac.at>

Arba Minch University

Partners of ROSA

Kinfe Kassa Ayano (Work package leader of Arba Minch
ROSA and Lecturer at Arba Minch University)

P. O. Box 21

Arba Minch

Ethiopia

T: +251-46-8815115

M: +251-911-745172

E: kinfe_k@yahoo.com

I: <http://www.amu.edu.et/rosa.shtml>

Case study of SuSanA projects

Arborloo for household sanitation

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**Authors: Wudneh Ayele Shewa (ROSA project), Bogale
Gelaye Geleta (ROSA project)**

Editing and reviewing: Norbert Weissenbacher (BOKU)

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