EcoSan ARA

Ecological Sanitation
Adapted to the Reality of Africa

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Low cost upgrading of pit latrines with urine diversion dehydration toilets (UDDT's) for private households

Bottom-up approach for:

handling

and valorisation

of human excreta in Fada N'Gourma, Burkina Faso

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EcoSan ARA: knowledge development on sanitation

- Informing and sensitizing of target groups about the EcoSan concept, and training of professionals in constructing EcoSan ARA toilets.
- Milestones and stakeholders of the project:
  - Study of the sanitation system of Fada N'Gourma (June – Oct. 2007).
    Download: http://www.zambolandia.com/papers/RdM_fada_fr.pdf
  - Development of EcoSan ARA toilets with local partners (Sept. – Dec. 2007).
  - Legal recognition of the association of the 10 – 15 manual toilet emptiers (Jan. 2008).
  - Formation of 8 – 10 masons (Jan. 2008)
  - Information workshop for cultivators and the public (Febr. 2008).
  - Autonomous commercializing of EcoSan ARA toilets by the masons (ongoing).

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Local conditions

- Fada N'Gourma is a sahelian, medium-sized town (50'000 – 100'000 inhabitants) in the East of Burkina Faso.
- The East of Burkina Faso is relatively marginalized in terms of infrastructure and economic potential, and thus focus region of German and Swiss development aid.
- Burkina Faso is one of the least developed and poorest countries of Africa (HDI rank := 161th out of 169 countries with data; 2009).

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We will talk about two taboo subjects:

- The security problems at work and hygiene problems in the handling of human excreta, i.e. the evacuation and deposing of these excreta.
- The application of human excreta in agriculture and horticulture.

"Shit" is not in the first place a swearword, but it's the term for a substance, which is rich in nutrients and therefore on the one hand can serve as a natural fertilizer, if used in a appropriate manner. On the other hand it can cause serious contamination of the ground water, used as drinking water, and of the entire urban environment, reducing the communities' quality of life because of bad odours and diseases provoked by the direct contact with faeces.

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In Fada N'Gourma you find :

- Very few water flush toilets
- A big majority of households using traditional pit latrines

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In Fada N'Gourma you find :

- 3 emptying teams using mechanic equipment (hydraulic aspiration trucks), coming from Ouaga and Pouytenga
- 6 - 8 teams offering manual emptying of pit latrines, living in Fada

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In Fada N'Gourma you find :

- Agricultural producers claiming to use exclusively animal excreta or chemical fertilizer on their fields
- Cultivators using human faeces


Without application of human faeces


With application of human faeces

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The problems in the management and valorisation of human excreta, encountered in the reality of Fada N'Gourma, ...

... exist on two levels:

- Safety at work for the emptiers and cultivators
- Public hygiene and health

In detail, this means :

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Contamination of human faeces:

- Sharp edged objects represent a danger for manual emptiers and cultivators, who are obliged to sort the excreta before using them as fertilizer.
- The fact that nearly all latrine pits are used at the same time as garbage bins (containing plastic bags, sanitary napkins, clothes, wigs, foetuses) seriously diminishes the quality of the faeces to be used as fertilizer.


Human excreta before separation

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Transformation of urine:

- The microbiological degradation of the mix of urine and faeces under anaerobic circumstances facilitates the transformation of the nitrate to ammonia and elemental nitrogen.
- Ammonia is a toxic substance in liquid or gaseous form, elemental nitrogen is a gas that escapes during the emptying of the pit.
- On the one hand this represents a contamination of the aquifer and a danger for the health of the emptiers, and on the other a loss of fertilizer.


Perforated latrine pits next to a borehole

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Degree of humidity:

- When the water of the shower is also directed into the latrine pit, the excreta show a much higher degree of humidity.
- At the beginning of their work, the emptiers sink 30 to 50 cm into the faecal sludge.
- This represents a threat to the emptiers health.


Latrine pit with very humid faecal sludge

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Illegal discharge :

- The faecal sludge is often discharged near the housings or even in the yard just beside the toilet.
- The pathogenic germs concentrated in the faecal sludge get easily transmitted by direct contact.
- This means a threat to the health of the public and the households, especially the children.


Illegal discharge in the street

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Loss of fertilizer:

- The escape of nitrogen in form of ammonia and elemental nitrogen and the degradation of the quality of the excreta by the application of sterilizing chemicals by the toilet emptiers constitute a significant reduction in quantity and quality of natural fertilizer for the local cultivators.
- This causes a significant economical loss for the agricultural production of Burkina Faso.


2 to 3 times higher yield due to the application of human excreta

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Working problems of the toilet emptiers:

- Lack of safety at work and adequate equipment.
- Lack of a formal cooperation network between the emptiers and the cultivators, who use human excreta.
- Lack of pricing formalisation for the toilet emptying in relation to the quality of the faeces, their transport and commercialisation.

Emptying of a latrine pit without boots, gloves or mask

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The concrete solutions envisaged by the project EcoSan ARA...

... work at two different levels:

- Development of environmental protection technologies adapted to the reality encountered in the field.
- Coordination, sensitization and training of the different stakeholders along the management and valorisation chain of human excreta

In detail, this means:

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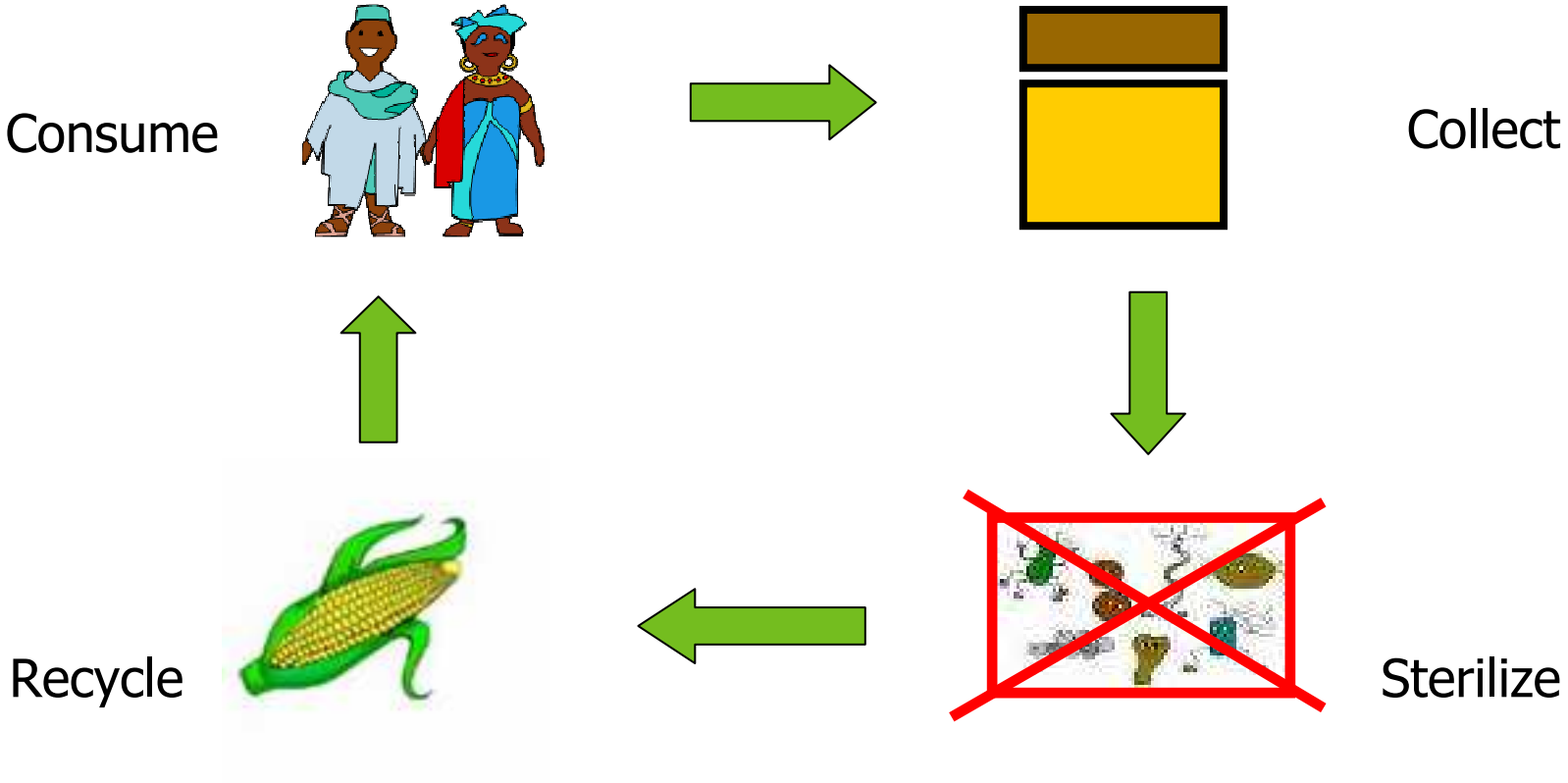
The EcoSan concept:

EcoSan := Ecological Sanitation

This means :

Human excreta are a resource, not waste!



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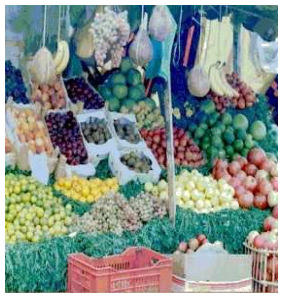
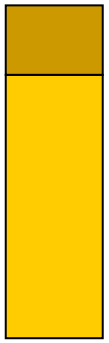
Quantity of fertilizers in the excreta:

Per year:





N = 2,8 kg
P = 0,4 kg
K ~ 1,3 kg
per person

N = 2,8 kg
P = 0,4 kg
K ~ 1,3 kg
per person

Urea = 6 kg
TSP = 2 kg
KCL ~ 2,6 kg
per person

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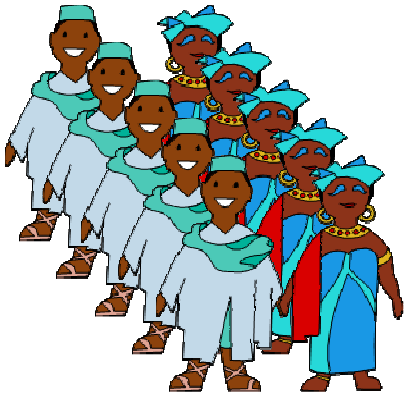
Loss of fertilizer:

Per year:

3'000 – 3'500 FCFA



30'000 FCFA

40 milliards FCFA

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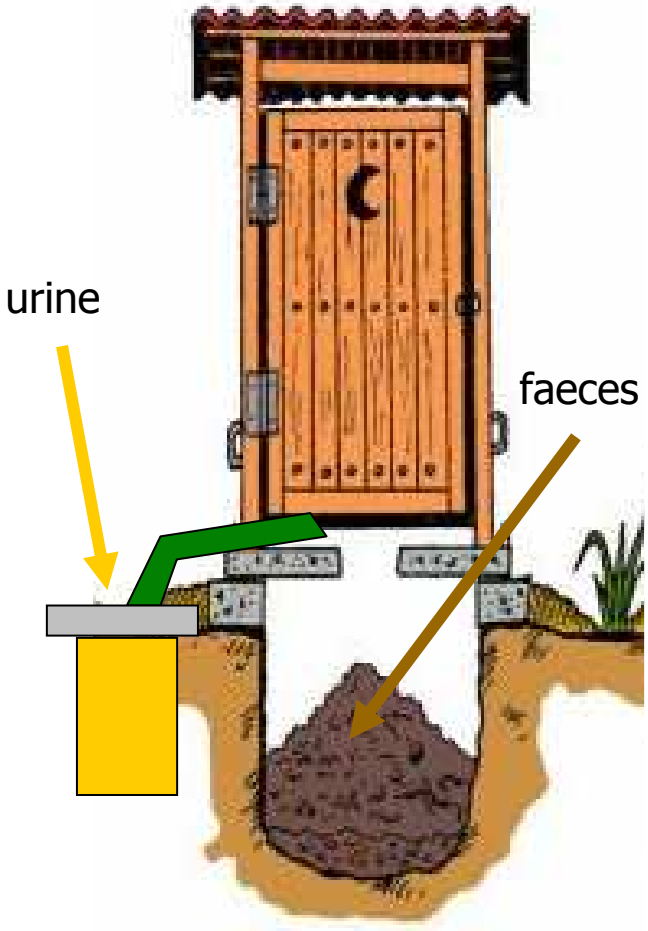
The objectives:

- Protect the environment and the aquifer
- Alleviate the work of the manual toilet emptiers
- Reduce bad odours, flies and health risks during the use and emptying of the toilet
- Reuse of the fertilizers and the organic matter for agricultural production

The beneficiaries:

- The manual toilet emptiers
- The cultivators
- The public



Separation and collection of the excreta in a simple pit and a container

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Disadvantages of conventional EcoSan toilets:

- Do not fit with the often existing sanitary infrastructure in ordinary Burkinabè private households.
- Human excreta have to be removed every 2 to 3 month by the owner oft the toilet.
- Can only be constructed by professional masons.
- Very high construction cost's for a Burkinabè middle and low income private household.
- Top-down approach to promote EcoSan toilets and valorisation of human excreta.

Price := 175 – 275 Euro

Conventional EcoSan toilet type Sky Loo (crepa Burkina)

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The EcoSan ARA toilet:

ARA := adapted to the reality of Africa

- Storage of the dry faeces in the existing pit, recovery of the urine in containers located in a separate chamber next to the toilet.
- Easy to apply on traditional latrines or VIP latrines.
- Easy to construct even by persons that are not professional masons.
- Can be used by persons who are used to do anal cleaning with toilet paper as well as those using water.
- Very low construction costs.
- Emptying by local, professional manual toilet emptiers after 3 – 4 years.
- Bottom-up approach to promote EcoSan toilets and valorisation of human excreta.

EcoSan ARA toilet on top of a pit of a traditional latrine

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The effects of separation of the excreta:

- The nitrate of the urine, which is very soluble in water and potentially toxic, doesn't get in direct contact with the aquifer.
- The phosphate contained in the faeces is not at all soluble in water and therefore does not affect the aquifer, even if it gets in direct contact with the ground water.
- The germs contained in the faeces do not affect the quality of the ground water, since the aquifer moves on average only a meter per year.
- As there is no water applied, the faeces are very dry and compact at the moment of emptying.


Urine containers of a EcoSan ARA toilet

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Treatment and hygienisation:

Faeces:

- Application of ashes, sawdust or dry soil accelerates the drying.
- Burying the faeces in the ground during 8 (with ashes applied) to 12 months (with sawdust or dry soil applied) or composting at high temperature during 6 months ensures the best treatment for eliminating the pathogens of the faeces.

Urine:

- Storage during 1 month in a firmly closed container ensures complete sterilisation of the urine.

Treatment by burying the faeces behind a yard

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Formalisation of the sector:

- Coordination of the different groups of manual toilet emptiers in a association.
- The association of toilet emptiers cooperates directly with the groups of cultivators for assuring the best elimination and valorisation of the excreta.
- The members of the association are ready to offer a discount of 1/6 of the total price if a toilet works with EcoSan and another 1/6 of the total price if the latrine pit is not used at the same time to dispose garbage.

Members of a association of toilet emptiers at their first GA

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Training of the masons:

- Professional training of masons enabled them to construct and install EcoSan ARA toilets.
- The masons know how to construct and commercialize EcoSan ARA toilets by themselves at a favourable price.
- In addition the masons are trained to offer workshops to the public, where everybody constructs their own EcoSan ARA toilet under professional guidance of the masons, at the cost of the raw material they use and the price of the workshop only.


The masons discuss the construction plans during a training workshop.

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Goals achieved by EcoSan ARA :

- Better protection of resources of ground water
- Better protection of the health of the toilet emptiers and the whole population
- More natural fertilizer for the cultivators
- More comfort and less costs for the users of the toilets
- Win situation for all stakeholder groups:
  - Toilet emptiers: Better work security, less expenses on chemicals
  - Cultivators: Better quality of fertilizer
  - Private households: Better hygiene in the toilets, additional income by selling excreta
  - Masons: Additional income by selling toilets and organizing construction work shops

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Application of urine I :

in a furrow

or

in a hole

At a distance of 5 to 10 centimetres from each plant!!!

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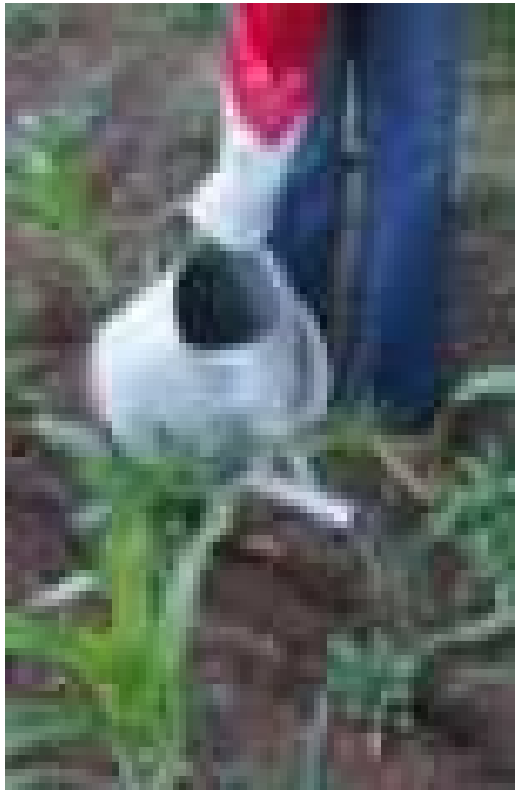
Application of urine II:

Add the urine in a furrow or a hole, add water and then close.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Dosage of urine I:

For

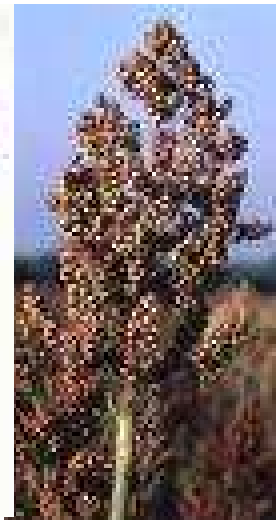
- Maize
- Sorghum
- Millet
- Chilli

For 1 plant: ½ a litre of urine applied in total

Frequency of application:

Sowing + 15 days: ¼ litre

Sowing + 30 days: ¼ litre

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Dosage of urine II:

For

- Cabbage
- Okra

For 4 plants : 1 litre of urine applied in total

Frequency of application:

Sowing + 15 days: ½ litre

Sowing + 30 days: ½ litre

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Dosage of urine III :

For

- Salad

For 5 plants: 1 litre of urine applied in total

Frequency of application:

7 days before sowing: ¼ litre

Transplanting + 15 days: ¾ litre

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Dosage of urine IV :

For

- Tomato

For 1 plant: 4 decilitres of urine applied in total

Frequency of application:

Transplanting + 10 days: 1 decilitre

Transplanting + 20 days: 1½ decilitre

Transplanting + 30 days: 1½ decilitre

Add a little bit of sawdust to the urine for increasing the concentration of potassium (K)!

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Dosage of urine V:

For

- Onion

For 10 plants : 1 litre of urine applied in total

Frequency of application:

Transplanting + 10 days: 3 decilitres

Transplanting + 20 days: 3 decilitres

Transplanting + 30 days: 3 decilitres

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Use of urine during dry season:

- Horticulture
- Stocking in containers until next rainy season
- Applying the urine in the fields in furrows (~ 1 litre per meter of furrow) or in holes (~ 1 container for 40 holes), which are closed afterwards
- Applying the urine in the manure pit (make a hole, apply the urine, close again the hole)

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Two types of EcoSan ARA toilets:

	Sitting position	Crouching position
		
Construction costs:	25'000 – 30'000 FCFA 38 – 45 Euro	8'000 – 10'000 FCFA 12 – 15 Euro
Selling price:	40'000 – 50'000 FCFA 60 – 75 Euro	15'000 – 20'000 FCFA **22 – 30 Euro**

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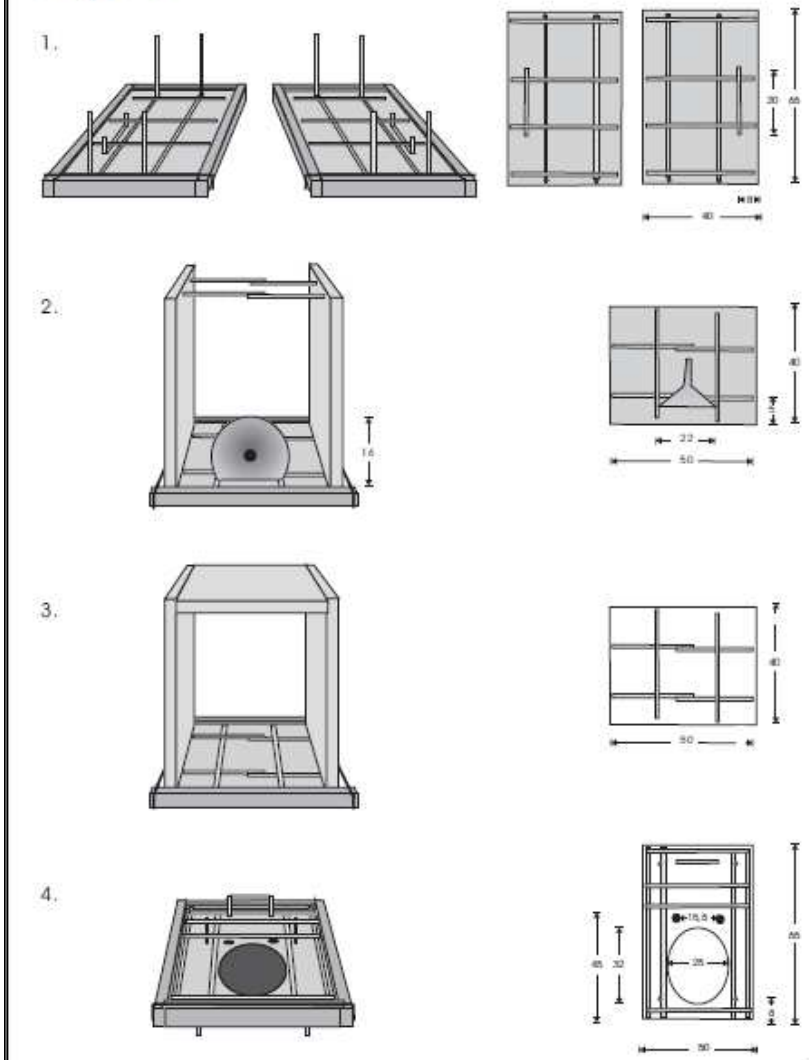
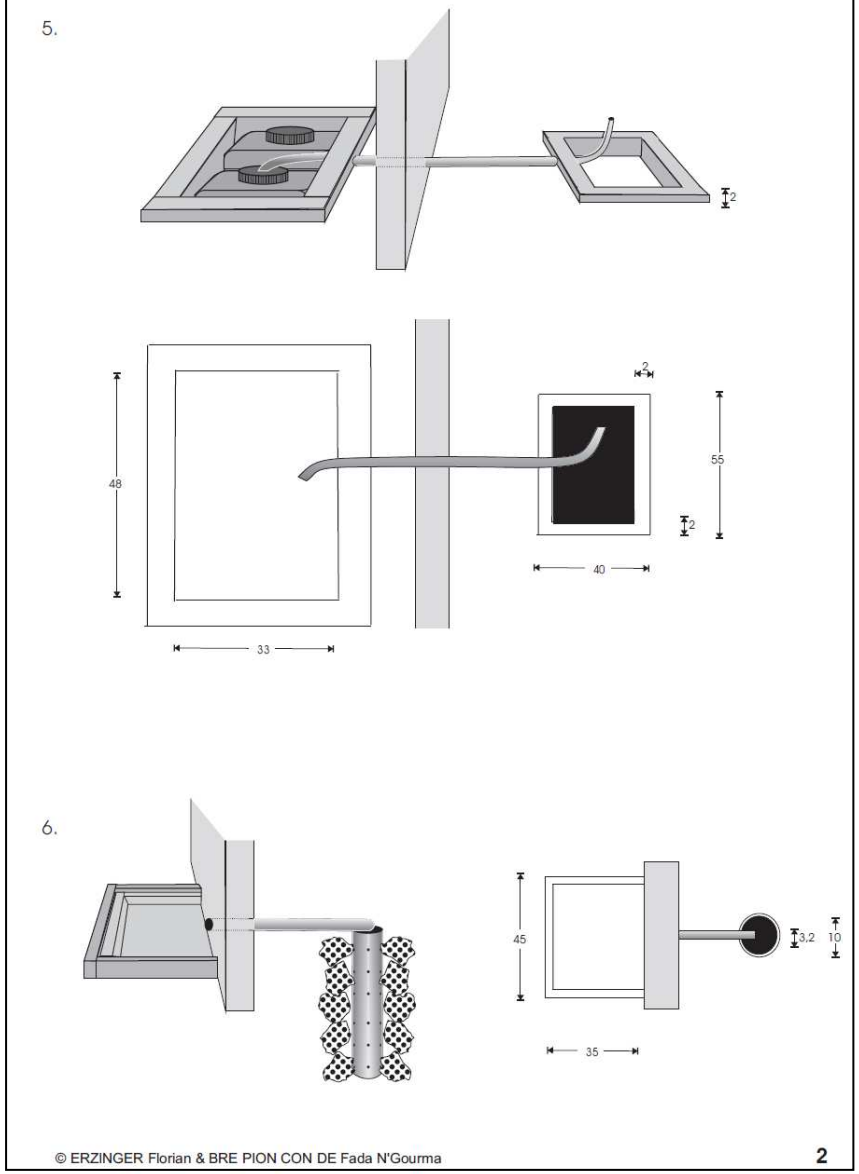
WC ECOSAN ARA (Adapted to the Reality of Africa)

Sitting position





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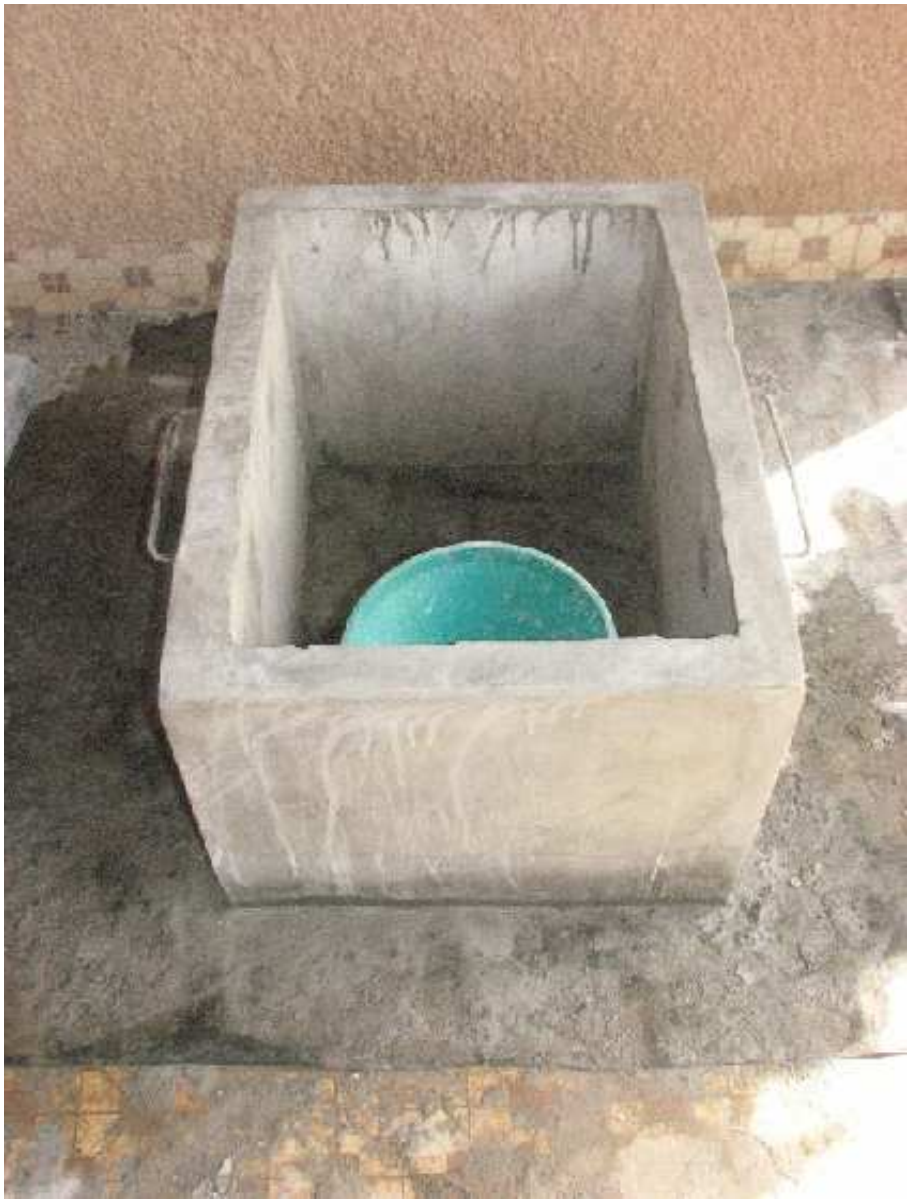

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Transformation of a pit latrine to an EcoSan ARA UDDT:

traditional
pit latrine

EcoSan ARA UDDT
(sitting position)

EcoSan ARA

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Thank you for your attention and successful construction!