# Making links between sanitation, agriculture, schools and the environment

## Many approaches to a varied need.

Peter Morgan

***Sanitation programmes in Africa have traditionally been seen as a means of providing excreta disposal facilities which can offer health benefits and clean the surrounding environment.***

***But the use of appropriate ecologically designed toilets and the re-use of their products can provide far more than a toilet facility alone.***

***The Stockholm Environment Institute through its Ecological Sanitation Research Programme (EcoSanRes) is supporting sanitation research in many parts of the world.***

***This ecological approach is able to link sanitation to agriculture, forestry and education as well as environmental and global issues.***

# Environmental and global issues - Alarming facts

*800 million people in 45 countries are malnourished

*Each day 40 000 die of hunger or hunger related diseases

*Most of Africa's farmland is degraded

*Over 5000 children die each day due to water-borne disease linked to a lack of basic sanitation

*The cost of fertiliser is very high in Africa and often scarce or unaffordable. It costs less in the USA

*Economically viable phosphorus reserves will be depleted within 50 years

*In Africa many school girls drop out because of lack of suitable sanitation.

*The rate of global deforestation is alarming

*Water supplies are becoming scarcer

(SEI 2009)

CAN ECO-SANITATION and the work of ECOSANRES HELP?

***New ecological approaches to sanitation can add vitality to existing programmes and may also help to solve some of the global problems***

**These include**

***1. Making links to agriculture***

***2. Teaching the younger generation***

***3. Improving the environment and assisting dwindling supplies of natural resources***

# *1. Making links to agriculture and improving food security*

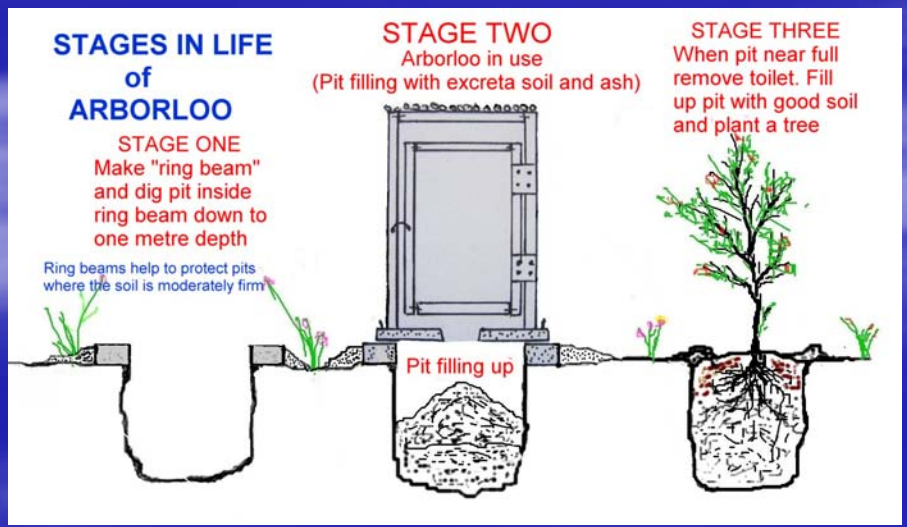
***Even the simplest toilets can do a lot more than provide excreta disposal alone.***

***The nutrients they contain can also be used to enhance food and tree production.***

***There are many ways of doing this!***

# Shallow pit composting

***The Arborloo is a simple shallow pit composting toilet which provides a good entry point into the world of ecological sanitation and recycling excreta for people living in the rural areas of Africa. It is based on methods used in traditional practice in Africa. The conversion of excreta into compost is accelerated by the addition of soil, ash and leaves into the pit. Valuable trees and other food plants can be grown on these pits.***




- *There are currently over 75 000 Arborloo's currently in use in West, East and Southern Africa as well as Ethiopia.*

- *Each Arborloo produces an "organic plug" of compost in the ground which is a mix of excreta, soil, wood ash and leaves. This lies underground and is covered by a layer of soil. These organic plugs in the ground enhance soil fertility*

- *In practice many food plants can be grown on Arborloo pits apart from trees – like these passion fruit in Malawi and pumpkins growing in Ethiopia!*

# *Usefulness of toilet compost*

*Toilet compost (a mix of excreta, soil, leaves and wood ash) can also be dug out of alternating shallow pit composting toilets (Fossa alterna) and mixed with topsoil to improve soil fertility*

*Dried faeces taken from urine diverting vaults (where urine and faeces are separated) can also be used to enhance the nutrient levels in topsoil.*

*Toilet compost is a valuable material. Although not as rich in nitrogen as urine, it contains valuable phosphorus and potash as well as nitrogen*

***Nutrient levels in toilet compost taken from Fossa alterna pits compared to local top soils in Harare area.***

| Soil | Nitrogen | Phosphorus | Potassium |
|---|---|---|---|
| **Top soils (Harare area) (N = 9 )** | 38 ppm | 44 ppm | 0.94 ME/100 gms |
| **Toilet compost *(Fossa alterna )* (N = 10)** | 275 ppm | 292 ppm | 4.51 ME/100 gms |
| **Toilet compost (Urine diverting)** | 232 ppm | 297ppm | 3.06 ME/100 gms |

# Recycling toilet compost

***The physical quality of toilet compost depends on what its constituents are. Excreta, soil, wood ash and leaves make a good mix! When toilet compost is mixed with an equal volume of poor soil, vegetable production can be increased significantly. Examples shown here are lettuce and spinach***


# Recycling urine
## Urine contains much valuable nitrogen

***When diluted urine is used on vegetables and on maize output can be increased significantly. Yields of green vegetables can be increased by several times by the application of urine. The same applies to yields of maize.***

# 2. Teaching the younger generation!

## (Schools Sanitation Programme)

*Teaching school children about sanitation – how to build simple toilets, make simple hand washing devices etc and how to grow healthy vegetables and trees using compost and urine adds an exciting new dimension to school curricula and sanitation promotion*

# Schools Sanitation Programme

*An introductory lecture using a flip chart and models also includes a lesson on how to make simple hand washing devices. Hand washing devices should be fitted to every toilet if health improvement is expected.*

# Schools Sanitation Programme

## Simple toilet construction.

School children can be taught how to make concrete slabs and ring beams and also toilet houses

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Here an Arborloo is being built

# Schools Sanitation Programme

## Simple toilet construction.

Making the toilet house, add the roof and a **hand washer** .
The children are proud – so are their parents!

# The “Children’s Toilet.”

## This is an *interesting innovation introduced into the Malawi eco-san program*

***A small slab (0.6m) is placed over a shallow pit and is used like an Arborloo by young children. Soil and ash are added in addition to excreta. When the pit is full extra soil is added on top. Children help to plant trees in this topsoil.***

***This low cost and simple method cleans the environment, teaches children how to use a toilet and also the child grows up with the tree!***

# Schools Sanitation Programme

## *Building Brick toilets*

***School children can also be taught how to build working brick toilets***

***Dig the hole. Line the pit with bricks using a "corbelling" technique where the top is narrower than the bottom. Fit the slab. Pits of larger capacity can be built this way! Then build a brick house!***

# Brick toilet construction.

School children have been taught how to make several designs of brick toilet. Some with doors and some without doors. The method is valuable to all, both boys and girls, teachers and parents!

# Schools Sanitation Programme

## *Garden experiments*

***The usefulness of urine and compost can be taught in school gardens. The knowledge gained can then be passed on to the teachers and surrouning communities. In this case small (1 metre diameter) "ring beam gardens" are used for initial trials!***

# *Quick results!*

**Garden experiments with diluted urine on poor soil**
**After a month the influence of urine treatment can be clearly seen for rape (X7), spinach (X4) and also maize!**
**Upper photos untreated, lower photos urine treated.**






These simple early trials had an influence on later uptake of the method.

School children and their parents, teachers and other members of the community were able the view the result.

Each plant was measured

# A good starter -Spinach!

The application of diluted urine on spinach (2litre in 10 litres of water - twice a week) enhanced the growth far more than commercial fertilisers in this school experiment!

# Tree planting

***The planting of valuable trees also forms part of the program. Trees are planted near to toilets so that the nutrients can be taken up. Accelerating the growth of trees using diluted urine is also taught. Trees are wonders of Nature and provide food, medicine and fuel etc. They also provide beauty and help to stabilise the atmosphere***

# Using diluted urine to accelerate tree growth

***Diluted urine applied weekly to young trees can accelerate growth considerably. This photo shows the effect of diluted urine (about half a litre of a 3:1 water /urine mix) applied weekly with regular watering. The tree on the left is obviously the urine treated tree. The urine contains nitrogen and other useful nutrients.***

# Planting trees around toilet pits

These gum trees were planted around the pit toilet on **5th October 2009,** watered for about 2 weeks to establish. After this diluted urine (2 litres urine diluted with 8 litres of water in a 10 litre watering was applied weekly. The 10 litres of diluted urine was enough to feed 2 trees. On the right the trees on **March 12th 2010,** after about 5 months of growth.

# Maize trials

Later a series of maize trials were conducted in the school garden using urine as a fertiliser.

Some rows of maize planted in poor soil were fed diluted urine and others water only

Huge differences were recorded!

# Maize trials

Each maize cob was measured in 3 experiments carried out in the garden

Very clear to see the effect of urine!

# Open Day

***A special day was set aside to show the community including parents, community leaders, officials, headmasters and even politicians the project.***

***The children explained how they built toilets and also how they used urine and compost to increase crop production.***

***Hundreds of people witnessed the effect of urine on maize and other plants!***

*This schools project has taught us that the school is an ideal place for teaching new methods and promoting new ideas!*

*The precious nature of the Earth and its fragility and the need to conserve and recycle is best taught first - in schools.*

*Seeing is believing*

*People can believe what they can see*

***Teaching practical construction methods and ecological principles in African schools can have far reaching benefits.***

***It teaches the generations of the future how to improve the yields of valuable crops and thus improves food security .***

***It builds knowledge and capacity within the school .***

***It teaches methods which are sustainable at low cost***
***It is simple, logical, practical, valuable and fun***

***By example it can improve the lives of surrounding communities.***

***New methods can be placed into national school curricular and even influence national policies related to health, education and agriculture.***

***It teaches us that we all form part of this living Earth***

***"With beauty all around me I walk…I am indeed its child***

***Absolutely I am Earths child"***

*Navajo "Song of the Earth"*