

Experiences

Composting

Extensive work has been done on low temperature composting of faeces (Morgan, 2003). In a series of experiments in Zimbabwe, vegetables such as spinach, covo, lettuce, green pepper, tomato and onion were grown in 10-litre buckets with poor local topsoil, and their growth was compared with that of plants grown in similar containers filled with a 50/50 mix of the same poor local topsoil mixed with an equal volume of humus derived from co-composted human faeces and urine. In each case the growth of the vegetables was monitored and the crop weighed after a certain number of days' growth. Table 9 shows the results of the trials (Morgan, 2003). These results show a dramatic increase in vegetable yield resulting from the enhancement of poor soil with the composted faeces and urine mix.



Figure 10. The onions to the left are unfertilized while those to the right are grown in a mixture of 50% poor sandy soil and 50% Fossa alterna compost. Photo: Peter Morgan, Aquamor.

Table 9. Average yields (grams fresh weight) in plant trials comparing growing in topsoil only, with growing in a mixture consisting of 50% topsoil and 50% Fossa alterna compost (Morgan, 2003)

| Plant, soil type and number of repetitions | Growth period | Fresh weight topsoil only g | Fresh weight 50/50 topsoil/FA*soil g | Relative yield fertilized to unfertilized |
|--|---------------|--------------------------------|---|---|
| Spinach, Epworth soil (n = 6) | 30 days | 72 | 546 | 7.6 |
| Covo, Epworth soil (n = 3) | 30 days | 20 | 161 | 8.1 |
| Covo 2, Epworth soil (n = 6) | 30 days | 81 | 357 | 4.4 |
| Lettuce, Epworth soil (n = 6) | 30 days | 122 | 912 | 7.5 |
| Onion, Ruwa soil (n = 9) | 4 months | 141 | 391 | 2.8 |
| Green pepper, Ruwa soil (n = 1) | 4 months | 19 | 89 | 4.7 |
| Tomato, Ruwa soil | 3 months | 73 | 735 | 10.1 |

* *Fossa alterna* soil

The effects are less pronounced on good and fertile soils. A literature review on experiences of compost used on such soils (Odlare, 2004) showed that at normal application rates of 30-40 tons of compost per hectare the immediate effects are small both on plant production and soil structure. Long term effects were mainly found. The application of compost results in an increased pool of organic N in the soil. This will slowly be mineralized, the rate depending on soil temperature, moisture and microorganisms. In total, about 20-30% of the N in the compost will become available to the plants over the years (Odlare, 2004). There are also long-term improvements in the soil structure and water-holding capacity. The best cultivation results will be achieved if the compost is applied together with mineral N in some form, e.g. in the form of urine.

Dried faeces from desiccation and storage

One way of recycling faeces to plant production is to plant trees in shallow pits filled with a mix of excreta, soil and ash. This is a traditional method in many African countries, even on deep pits. While the actual growth of trees on these pits has not been scientifically measured in comparison with trees growing on topsoil nearby, there are many reports of enhanced growth. The increased growth is due to the tree taking up nutrients from composted excreta held in the pits. Although the nutrient amounts in these pits are high and cannot be fully utilized by trees, even over decades, this is a simple and cheap ecological sanitation method, which hopefully can increase the interest in other methods where the nutrients are more efficiently utilized.

A field experiment has recently been started in Burkina Faso (Klutse, pers. comm.), where dried faeces are being used as fertilizer on trees such as mango and banana, Figure 11. A shovel full of faeces is mixed in with the soil in the pit just before the planting of each tree. No results are available yet.

Digestion residues

The effect of digestion residues has been investigated in Sweden (Åkerhielm & Richert Stintzing, in press) and India (Godbole et al., 1988). Results from Sweden show that digested food residues gave yields ranging from 72 to 105% of the yields with equal amounts of total



Figure 11. Fruit trees growing on Arbor Loo pits in Malawi. The Arbor Loo is shown in the background. Photo: Peter Morgan, Aquamor.

N in mineral fertilizer. Results from India show that over four years, digestion residues from small scale biogas plants gave higher or as high yields as farmyard manure or urea fertilizers, at equal levels of applied total N.