DISPOSAL OF FAECAL SLUDGE BY DEEP ROW ENTRENCHMENT

FSM2

Durban, 31 October 2012

David Still
After pits have been emptied, what can we do with the contents?
Screening of waste – expensive and very messy

Durban, Plan A
In terms of nitrates and total solids the contents of 1 VIP = 500 to 1000 kℓ of sewage
But is sludge “waste”?
The demographic transition
World population in billions

Can we sustain it, or will we crash and burn?

The “Anthropocene” Era
What do you need to feed the world?

70% of the world’s fresh water resources are already used for agriculture

Without using energy, we can’t make more of it
What do you need to feed the world?

Soil is where food begins – to grow food you need healthy soil with nutrients.
Historical global sources of phosphorus fertilizers (1800-2000)

(Cordell, 2009)
Phosphorus Price Soared in 2007-2008

Phosphate rock price chart

World Bank Commodity Price Data (2010)
How long will our known phosphate rock reserves last?

• 172 years projecting current trends

• 126 years assuming rising standards of living (esp. Africa)

• 48 years if world obtains 10% of energy supply from biofuel
Human excreta – a neglected treasure!

N = 2.8 kg  
P = 0.4 kg  
K ≈ 1.3 kg  
Per person per year

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Urea = 6 kg  
TSP = 2 kg  
KCL ≈ 2.6 kg

Enough fertiliser for 300-400 m² of crops
Fertilizer value from human waste

- Organic fertilizer retails for R10/kg

- Fertilizer value in pellets from eThekwini pits is approx 1/3 compared with commercial organic fertilizer (but fresh VIP waste has much higher fertilizer content)

- Conservatively work on R1 per dry kg, then the fertilizer value per full VIP is approx. R1 000 (compare value of a bakkie load of kraal manure – but this is richer)

- If 10 000 VIPs are being filled per annum, the fertilizer value is approx. R10 million
Tera Preta Soils – Amazon basin, use of domestic waste to enrich soils practiced for thousands of years
Pit emptying is not so bad when the sludge is matured.
Sludge – close up.
Sludge burial research site - Umlazi
Umlazi Trial – sludge burial Jan 2009
26 January 2012 –
three years after planting
Monitoring of groundwater

- E-coli
- Heterotrophic plate count
- Nitrate
- Ammonium
- Chloride
- Sodium
- Conductivity
Potentially viable ova count (ova/g) vs. Days since burial

The scatter plot shows the relationship between the days since burial and the potentially viable ova count. The y-axis represents the number of potentially viable ova per gram (ova/g), while the x-axis represents the number of days since burial. The data points are scattered across the graph, indicating variability in the ova count over time.
Sappi site

10 km west of Howick on Karkloof rd
Monitoring of subsurface liquid flux and water content:

Material hydraulic/physical properties:
- Porosity/density
- Water retention characteristic
- Hydraulic conductivity characteristic
Difference in basal area over time
Relative Volumes for different treatment methods, including dead trees
What to do with the sludge - conclusions

• Disposal on site into a nearby pit or a trench is the simplest, cheapest and most practical option

• Plant a tree or trees over the sludge to gain some advantage from the nutrients in the sludge

• If you don’t want to or can’t bury the sludge, compost it or pelletize it
Obstacles to large scale entrenchment in South Africa

• Faecal sludge is classified in terms of legislation as a hazardous waste due to the pathogen content – this has implications for handling and transport.

• A large scale burial site (more than a few hundred m$^3$) is classified as a landfill – this has extensive implications in terms of permission and monitoring.

• However, productive use of biosolids in the forestry sector in other parts of the world is well established - can be done. With more pilot scale research the risks can be better assessed and defined.
Thankyou