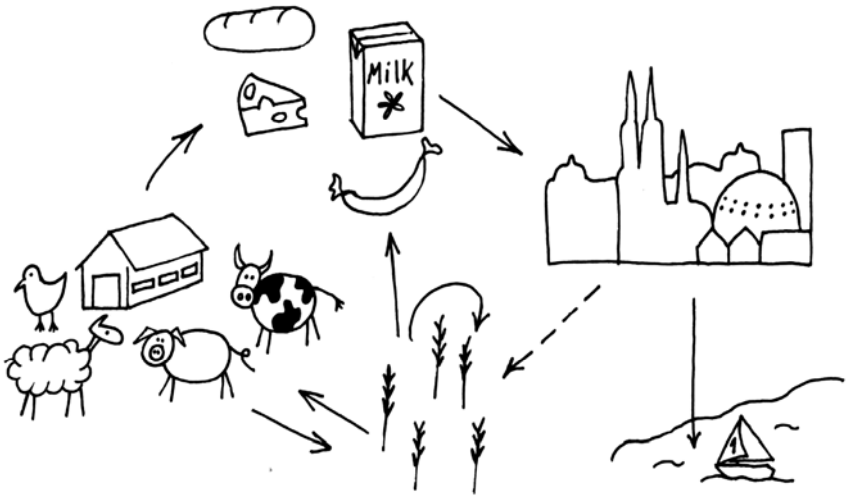
Waste to Worth – manure for animal feed

Dr Björn Vinnerås
Assoc Prof Environmental Engineering
SLU/SVA

Mini CV

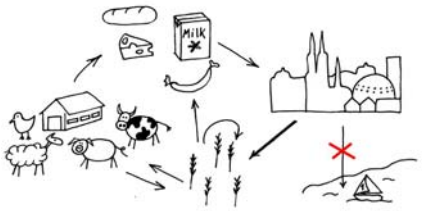
- Environmental Engineering SLU
  - PhD 2002
  - Assoc. Prof. 2008
- SLU since 1997 / 50% SVA since 2003
- Research Profile
  - Sustainable sanitation
  - Hygiene technology
    - Biological treatment
    - Chemical treatment
  - Sweden, Uganda, Brazil & Vietnam oriented research
  - PhD supervisor
    - 3 PhD main supervisor
    - 4 PhD dpt supervisor

Nutrient flow in society

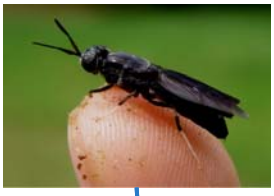


Recycling systems

- Fertiliser production
  - Organic waste
  - Manure
  - Human manure
- Treatment
  - Composting
  - Biogas treatment
  - Storage
- Fertilisation of plants

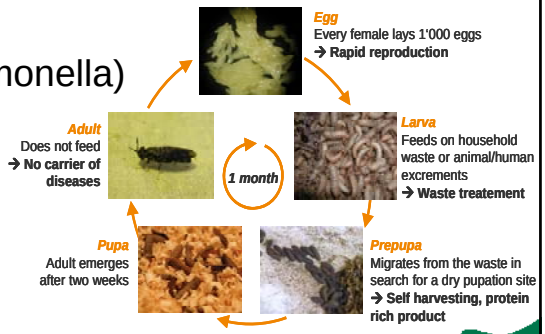


Waste to worth – a shortcut



Black Soldier Fly

- Dry mass reduction 60-80%
- 1kg DM prepupae per 10kg waste
- Inactivate bacterial pathogens (e.g. Salmonella)
- Pre-pupa
  - 40% protein
  - 30% fat
- Self harvesting



Fast consumption of organics

Start

2 hours

4 hours

7 hours

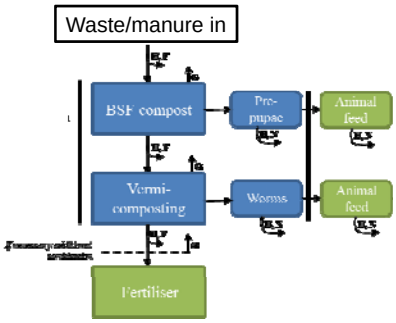
Photo; Stefan Diener

Vermicompost

- Mass reduction 50-70%
- Inactivate pathogens?
- Worms
  - 10% of waste into body mass
  - 70% proteine
- NH_3 sensitive
- Hand harvested

Waste to worth – the concept

- Raw manure in
- BSF processing
  - TS drop
  - Pre pupae out
- Vermicomposting
  - Waste minimisation
  - Worms out
  - Fertiliser out



Risks

- Hygiene
  - Salmonella are removed
  - Ascaris ova survive
  - Viruses?
- Hygiene of feed
  - Risk for virus and parasites
  - Solution – Cross flow
- Un-known substances
  - Pharmaceuticals
  - Antibiotics

It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.

Potential

- High quality animal feed
- Local feed production
- High utilisation of nutrients – less land use
- Waste minimisation
- Clean
  - Water
  - Environment

Conclusion

- 1 000 kg DM manure give
  - 100kg DM BSF prepupae
  - 50kg DM worms
- High protein production
- Waste minimisation
- Less pollutions
- Decreasing land requirements
- Large potential for tropical areas

Acknowledgement

- Finances
  - SLU
  - Swedish Ministry of Foreign Affairs as part of its special allocation on global food security
  - EAWAG/SANDEC
- People
  - SLU
    - Dr Cecilia Lalander
    - Alexander Johansson
  - EAWAG/SANDEC
    - Christian Zurbrügg
    - Dr Stefan Diener