Linking Solid Waste Recycling to Sanitation

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Segregated Organic Waste Management

Inorganics
Organic solid waste
Toilet waste

Input Products
User Interface
Input/Output Products
Collection and Storage/Treatment
Input/Output Products
Conveyance
(Semi-) Centralized Treatment
Input/Output Products
Use and/or Disposal

Ability? Worth the effort?

Disclaimer: This sanitation system was created using Eawag's Sanitation System Drawing Tool (Version 1). The user of this tool alone is responsible for the correctness and completeness of this system.
Possibilities


**DIRECT USE**
- Direct land application
- Direct animal feed
- Direct combustion

**BIOLOGICAL TREATMENT**
- Composting
- Vermicomposting
- Black Soldier Fly treatment
- Anaerobic digestion
- Fermentation

**PHYSICO-CHEMICAL TREATMENT**
- Trans-esterification
- Densification
- Pyrolysis
- Liquefaction
- Gasification

**TECHNOLOGIES**
- Trans-esterification
- Bio-diesel
- Methane

**PRODUCTS**
- Compost
- Biogas
- Bio-ethanol
- Pellets/briquettes
- Worms
- Larvae
- Digestate
- Glycerol

**END-USE**
- Agriculture
- Bio-energy
- Transport fuel
- Cooking fuel/heat/electricity
- Bio-oil
- Gas
- Char

**TECHNOLOGIES**
- Bio-ethanol
- Pellets/briquettes
- Biodiesel
- Glycerol

**PRODUCTS**
- Meat/fish production
- Animal husbandry
- Crops production
- Agriculture
- Bio-energy
- Transport fuel
- Cooking fuel/heat/electricity
- Bio-oil
- Gas
- Char
Resource recovery: Choice by market demand

Waste Sourcing

- Behavior?
- Incentives?
- Accessibility?
- Quality?

Treatment Technology

- Composting
  - Co-composting
- BSF processing
- Vermicomposting
- Briquetting/Pelletizing
- Pyrolysis
- Anaerobic Digestion

Transport?

- Price?
- Consistency?

Waste-derived products & markets

- Availability?
- Costs?
- Ability?
- Maturity?
Example: BSF treatment

Waste Sourcing

BSF Treatment Technology

Nursery

Treatment

Waste-derived products & markets

Cherry-picking or solving public challenges?

Quality control! Multiple revenue streams!
BSF example: Facility in Indonesia

Operational skills?

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Example: FS for fuel (SEEK project in Uganda)

Waste Sourcing

Sludge quality and sand!

FS Treatment Technology

Challenges with dewatering

Challenges with gasifier

Waste-derived products & markets
Conclusions

Technology
- Develop technology and services around products
- Ensure consistent quality products
- Do not underestimate waste sourcing

Financial
- Double revenue streams required
- Increase cost effectiveness in operation
- Cherry-picking or impacting on public health issues?

Institutional & Awareness
- Assess environmental sustainability (LCA)
- Create incentive-based systems
- Communicate positive examples with evidence

Linking sanitation to solid waste
- Synergies possible
- …but risks increase