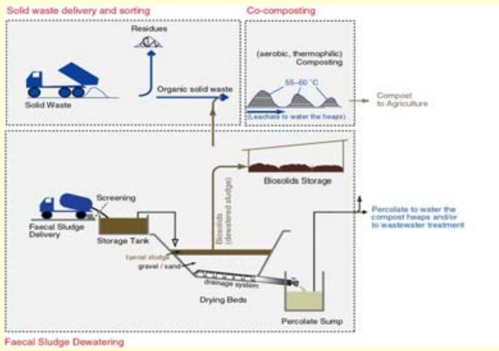
Co-composting of Faecal Sludge and Municipal Organic Waste for Urban and Peri-urban Agriculture in Kumasi, Ghana



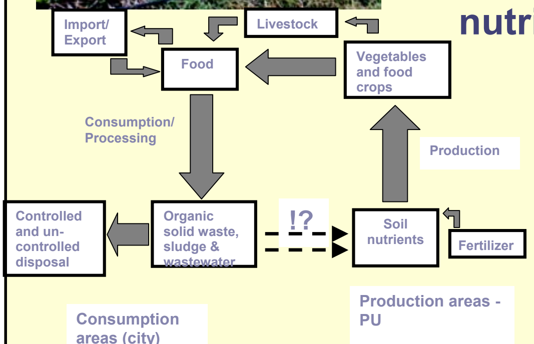
IWMI/SANDEC/KMA/KNUST Collaborative project

Introduction

- Waste disposal is a serious environmental problem confronting urban governments in Ghana.

- Solid wastes (SW) and Faecal sludge (FS) with the inherent nutrients are often dumped into watercourses and drainage ditches.

- On the other hand, the challenge of urban food security has facilitated urban and peri-urban agriculture with high nutrient input



Urban areas as nutrient sinks (Drechsel *et al.*, 1999; modified)

Project Location

- Kumasi is the second largest city in Ghana
- The population is 1.12 million (GSS, 2000)
- Average SW generation is 850 tons/day
- Average FS generation from on-site sanitation systems is 500 cubic meter/day

Previous studies (NRI, 2000; Belevi et al 2001; IWMI 2001) reveal that:

- there is enough solid and liquid waste currently dumped as refuse, which could be recycled
- Redirecting this would allow to cover the N and P demand of urban agriculture and in addition 13% of the N and 25% of the P demand of peri-urban agriculture
- Co-composting highly recommended

Co-composting requirements

Design criteria

- C/N ~ 25-30
- Humidity ~ 50-60%
- pH ~ 6-8
- Windrow size ≥ 1 m3
- Aeration (forced or natural)

Process control

- Temperature measurement (T=55-65°C during thermophilic phase)

Approximate C/N ratio for some compostable materials[1]

- Nightsoil ~ 6-10
- Weeds ~ 19
- Farmyard manure ~ 14
- Wheat straw ~ 128
- Fresh sawdust ~ 511
- Fruit wastes ~ 35
- Refuse ~ 30-80

[1] Obeng and Wright (1987) The Co-composting of Domestic Solid and Human Wastes UNDP/World Bank

Mixing ratio

FS + other compostable materials

→ ***Optimum (porosity, humidity, C/N)***

Experiences carried out so far:

FS* : other materials = 1: 3-10
*75-96% water content

Objectives

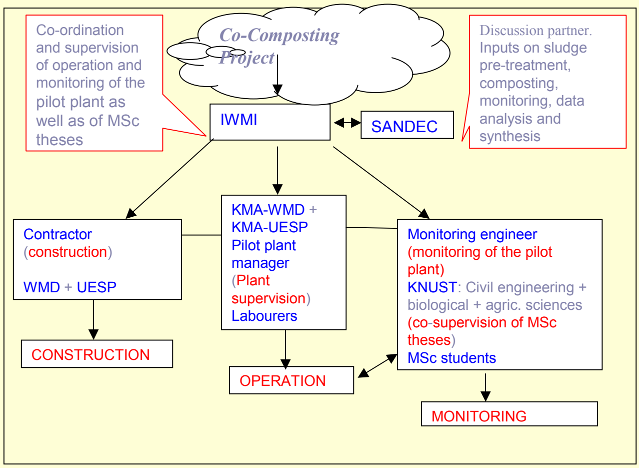
- To gain scientific and technical knowledge on the options of co-composting SW and FS and to have at hand strategies that will ensure its sustainability for the benefit of city authorities and farmers.
- Specifically, the project:
  - Studies the technical and operational aspects of co-composting
  - Assesses the agronomic and socio-economic aspects of co-composting
  - Enhances human capacity for urban waste management

Approach/Methodology

1.Formation of a project committee comprising of various disciplines representative of :

- IWMI
- SANDEC
- KMA
- KNUST

Project Organisation chart



2. Establishment of a small scale pilot station

The compost station comprises of :

- FS discharge bay
- Two drying beds
- Two percolate collection chamber
- A percolate storage tank
- Composting, screening and bagging section
- A site office and storeroom

3. Monitoring the technical and operational aspects of co-composting to assess its sustainability

- FS Pre-treatment: to have appropriate recommendations for design and operation of a faecal sludge pre-treatment system for co--composting

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- Testing different SW : FS mixing ratios to know the optimum that will allow a well functioning composting process while allowing the treatment of a large proportion of sludge
- Find out quality and quantity of wastewater as well as appropriate management system.
- Investigate the mode of operation of the whole system (sludge pre-treatment + co-composting) that could minimize N losses
- Inactivation of indicator pathogens– clostridium and helminthes

4. Ensuring sustainable composting: marketability!

- Preliminary acceptability test revealed the following:

Perception of co-compost

Farmer	Very good (%)	Good (%)	Repulsive (%)	Indifferent (%)
Urban vegetable farmers	32	64	4	-
Backyard farmers	60	20		20
Ornamental farmers	20	80	-	-
Urban food crop farmers	30	30	-	40
PU vegetable farmers	25	62.5	4	8
PU food crop farmers	43.8	12.5	3	19
PU fruits farmers	40	60	-	-
Compost users	30	70	-	-
Non-compost users	27	52	8	13

Source:(Danso, G. 2001 IWMI-Ghana Internal Report)

Acceptability of co-compost

Willingness	to use	to pay
Yes	77	63
No	23	37
Total	100	100

Factors to motivate the use of compost

Factors	% of Respondent
Field trails	55
Education	22
Others, specify	17
Availability	5
Education and trials	5
Site of the plants	2
Price of the substitutes	2
Type of the product	2
Total	100

Next steps

- Field trials with selected vegetables
- Evaluation of cost and benefits of processing and utilization of co-compost

5. Capacity building

- Four scientific staff of the local university and two engineers of the City's Waste Department are involved in project activities.
- Seven MSc. students are involved in monitoring
- 1 project assistant cum compost plant manager is learning on-the-job.

Expected Output

- A rich and hygienic compost
- Strategies to ensure marketability of the product
- Recommendations for design, operation and maintenance of a co-composting station treating liquid and solid waste
- Capacity developed within the key stakeholder institutions

Conclusions

- Composting plant is in place
- Role of different stakeholders are satisfactory
- Monitoring of co-composting process is going on
- 63 % of farmers interviewed in preliminary perception study are willing to use and buy it
- Nevertheless, they want to see the compost tried out