

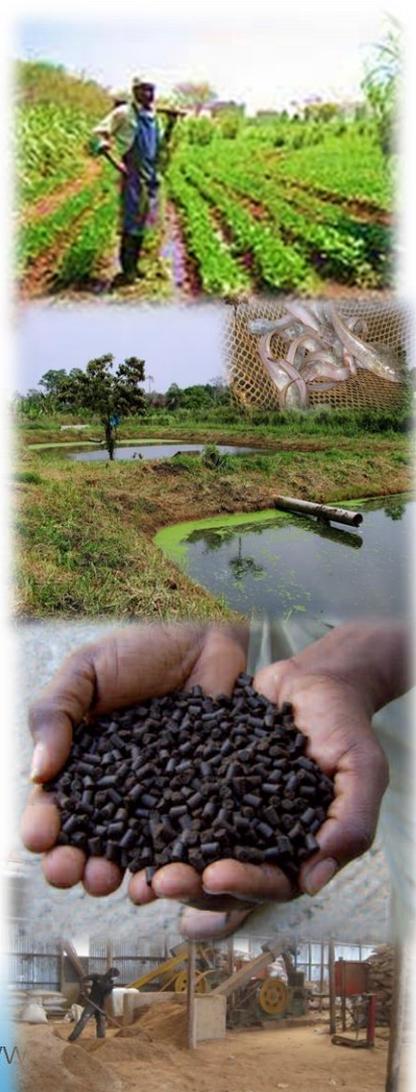
Converting Faecal Sludge to Fertilizer Pellets: the case of *Fortifer*



Olufunke Cofie & Josiane Nikiema
IWMI West Africa, Accra, Ghana

OUTLINE

- Background
- Process
 - FS dewatering & Composting
 - Enrichment
 - Pelletization
- Field application
- From pilot to commercialization



BACKGROUND

- Main motivation:
 - Land and water pollution due to poor FS management
 - Poor soil fertility and resulting low agricultural productivity in SSA

FS generation in SSA

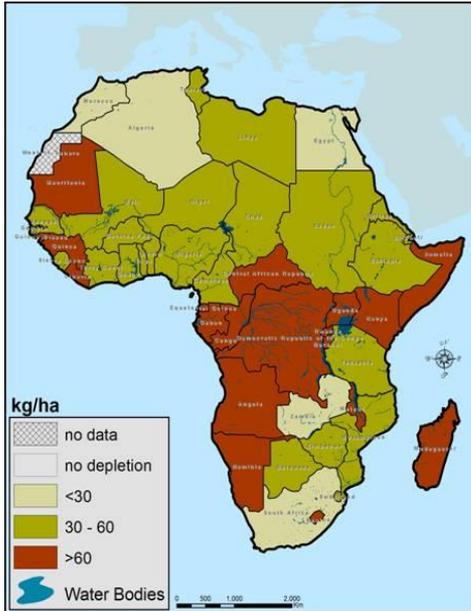
- Unsewered sanitation facilities
- Open defecation
- Problem of disposal
- Lack of functional treatment facilities
- Financing



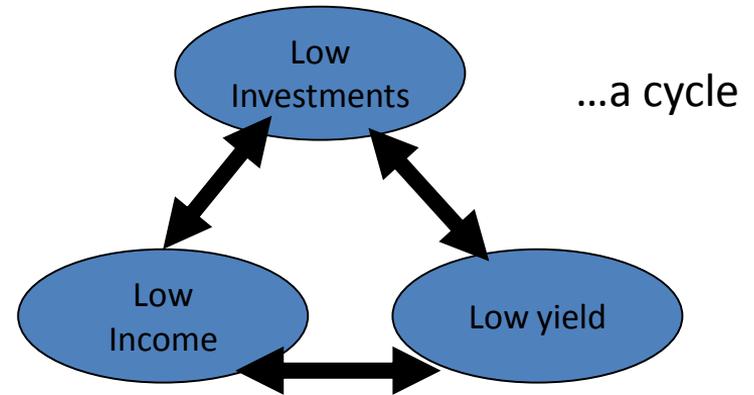
<1% of FS generated in SSA is actually treated leading to water and land pollution

Agriculture in SSA

- Mainstay of African economy; Employs about 70% of population.
- Low inherent fertility (OM), nutrient depletion
- Low per capital fertilizer use - 9 kg/ha (*world av. 90kg/yr*)
- Low yield



Africa loses \$4billion/yr in soil nutrients
2002-2004: IFDC



OPTIONS FOR RECOVERY



RESEARCH
PROGRAM ON
Water, Land and
Ecosystems



RESOURCE RECOVERY & REUSE SERIES 2

2

Technological Options for Safe Resource Recovery from Fecal Sludge

Josiane Nkema, Olufunke Cofe and Robert Impraim



Co-composting of FS & organic waste

- Sawdust
- Organic municipal solid waste
- Empty fruit bunches from oil palm
- Cocoa pod husk
- Rice husk

www



CO-COMPOSTING OF FS

Dewatered FS

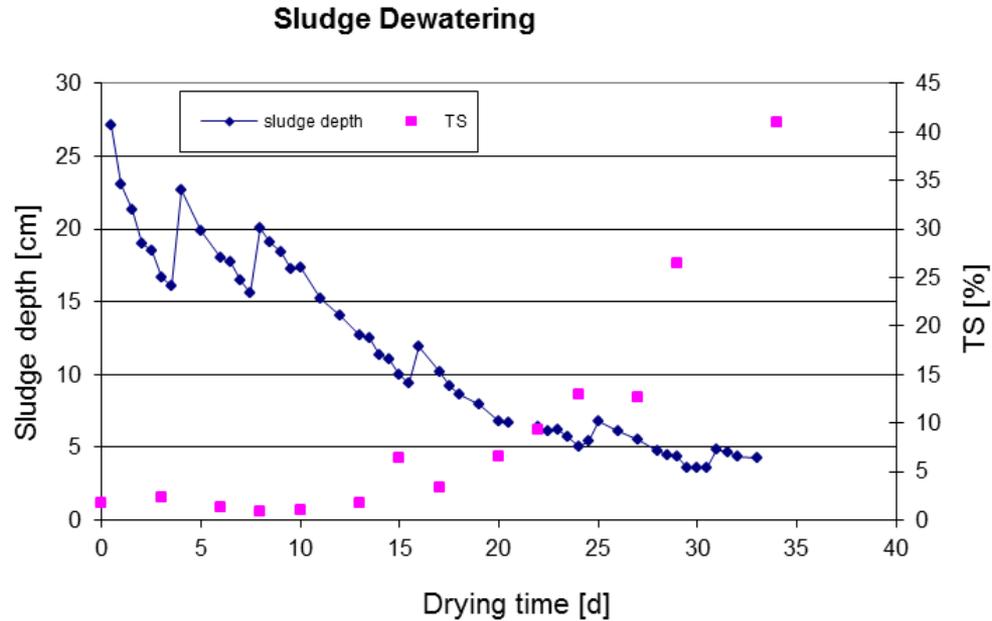
FS + SW



Pros & Cons

- + high recovery of nutrient and organic matter for a range of uses; good quality product
- + minimal health risk
- Capital investment required; - Time required

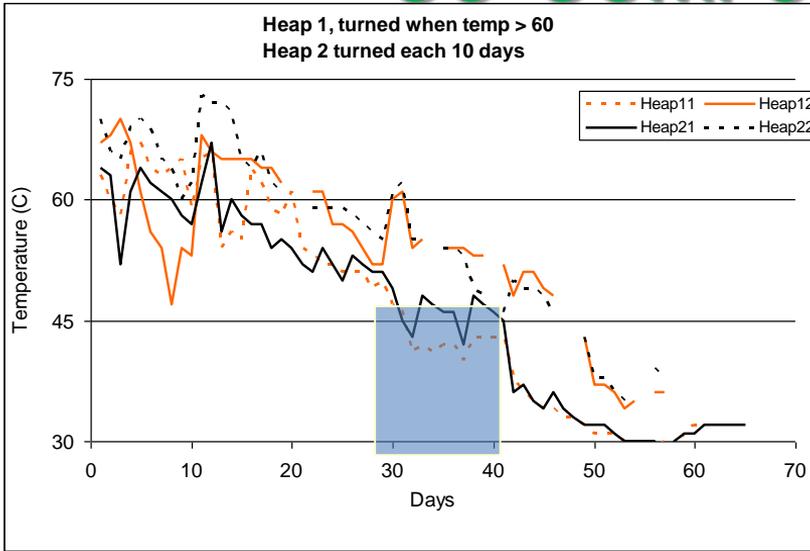
FS DEWATERING



Decrease in sludge depth and increase in total solid content as measured in sludge drying beds



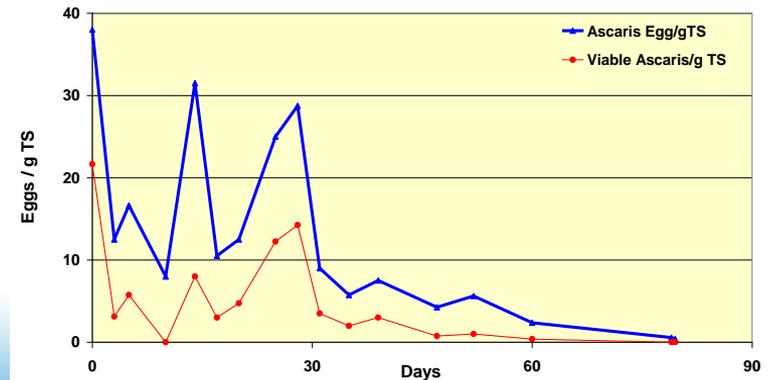
CO-COMPOSTING



Co-composting process allowed to maintain temperature at > 45°C for more than 30 days

- HE viability in raw FS = 30-50 %
- Number of HE < 5/g TS in the end product → viable HE < 0.5 HE/g TS

Helminth Eggs (Ascaris and Trichuris) die off during co-composting : results from Buobai Co-composting plant/Ghana



ENRICHMENT

- Allows to align the composition to the needs for different crops and soil
 - Compost and inorganic N fertilizer to give better yields ...
 - Lower amounts of each is required



PELLETIZATION

- Increases bulk density of co-compost
- Allows steady release of nutrient
- Reduces dust during handling



Quality

Sanitation Product	N (%)	P (%)	K (%)	Carbon (%)
SW Compost	1.22±0.09	1.80 ± 0.17	0.79 ± 0.10	8.50 ± 0.87
Co-compost	1.35 ± 0.02	1.60 ± 0.10	1.90 ± 0.12	10.23±0.50
Comlizer (Excreta based)	3.10 ± 0.07	1.14 ± 0.02	1.40 ± 0.06	9.70 ± 0.01
Comlizer (Solid Waste based)	2.92 ± 0.21	0.42 ± 0.04	2.66 ± 0.18	6.38 ± 0.92
FS	2.06 ± 0.24	2.44 ± 0.09	0.47 ± 0.01	7.09 ± 0.29

Products*	Total C %	Total N %	Total P mg/kg	Avail. P mg/kg	Total K mg/kg
DFS					
I-DFS	76.9	1.78	2541	1569	4600
C-DFS	65.1	1.77	10848	232	4350
C-SDFS	71.3	1.20	3333	71	2533
EC- DFS	36.7	3.00	10693	224	4300

FIELD APPLICATION

- Greenhouse and on-farm



**Rice field
(conventional
Farmer's
practice)**

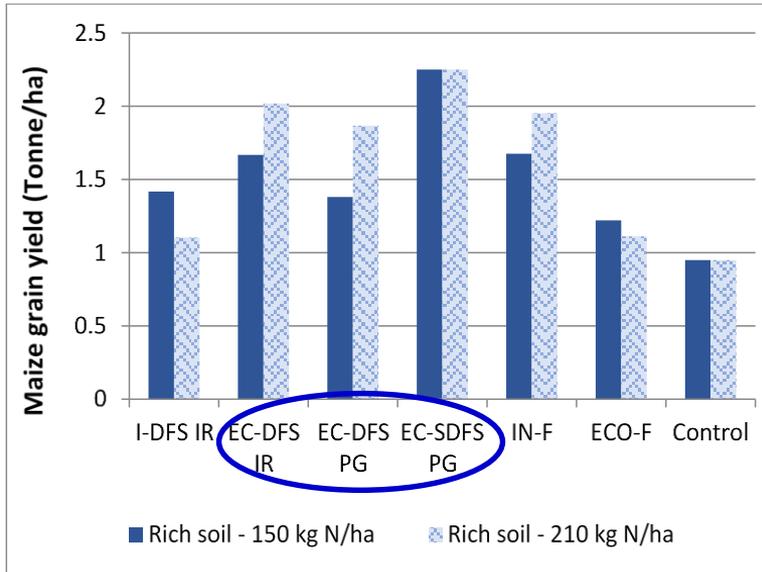
200 kg of NPK 15-15-15 and 100 kg of AS. Top dressed with 50 kg of urea



**Rice field with
Fortifer.**

1,000 kg of enriched compost. Top dressed with 30 kg of ammonium sulfate (AS)

FIELD APPLICATION



Fortifer pellets

Site	Dawhenya irrigation project	Kpong irrigation project at Asutsuare	Okyereko irrigation project site
Year of trial	2011	2010	2012
Yield difference	+50% with Fortifer powder	+24% with Fortifer powder	<ul style="list-style-type: none"> +32% on salt affected soils +38% on normal soils
			With Fortifer powder

- Fortifer was comparable or better than the inorganic fertilizer
- Fortifer performed better than the commercial compost (Eco-F)

SCALING UP

- Towards commercialization
 - Business model
 - PPP
 - Marketing
 - Product & Process certification



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Resource Recovery From Waste

Business Models for Energy, Nutrient and Water Reuse

Edited by Miriam Otoo and Pay Drechsel, International Water Management Institute, Sri Lanka

About this Book
Humans generate millions of tons of waste every day. This waste is rich in water, nutrients, energy and organic compounds. Yet waste is not being managed in a way that permits us to derive value from its reuse, whilst millions of farmers struggle with depleted soils and lack of water. This book shows how resource recovery and reuse (RRR) could create livelihoods, enhance food security, support green economies, reduce waste and contribute to cost recovery in the sanitation chain. While many RRR projects depend on subsidies and hardly survive their pilot phase, hopeful signs of viable approaches to RRR are emerging around the globe including low- and middle-income countries. Many of these new commercial pathways are being charted in the informal sector, delivering innovative approaches for cost-recovery. These enterprises or projects are tapping into entrepreneurial initiatives and public-private partnerships, leveraging private capital to help realize commercial or social value, shifting the focus from treatment for waste disposal to treatment of waste as a valuable resource for safe reuse. The book provides a compendium of these success stories. It presents for energy, nutrient and water recovery innovative business models based on approximately 70 empirical cases from around the world, each described and evaluated in a systematic way. The focus is on municipal, agro-industrial and food waste and business models with potential for large-scale out- and up-scaling. For each model, safety concerns and risk mitigation measures are highlighted. This is the first book on business models and their enabling environment for the reuse-oriented sanitation sector.

March 2015 - Approx. 640pp
Hardback Price: \$215.00

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References

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<http://www.iwmi.cgiar.org/issues/resource-recovery-and-reuse/related-projects/>