Biofertilizer Potential of Food Waste Anaerobic Digestion on Small Farms

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Soil and Water Science

Agriculture and food waste dilemma

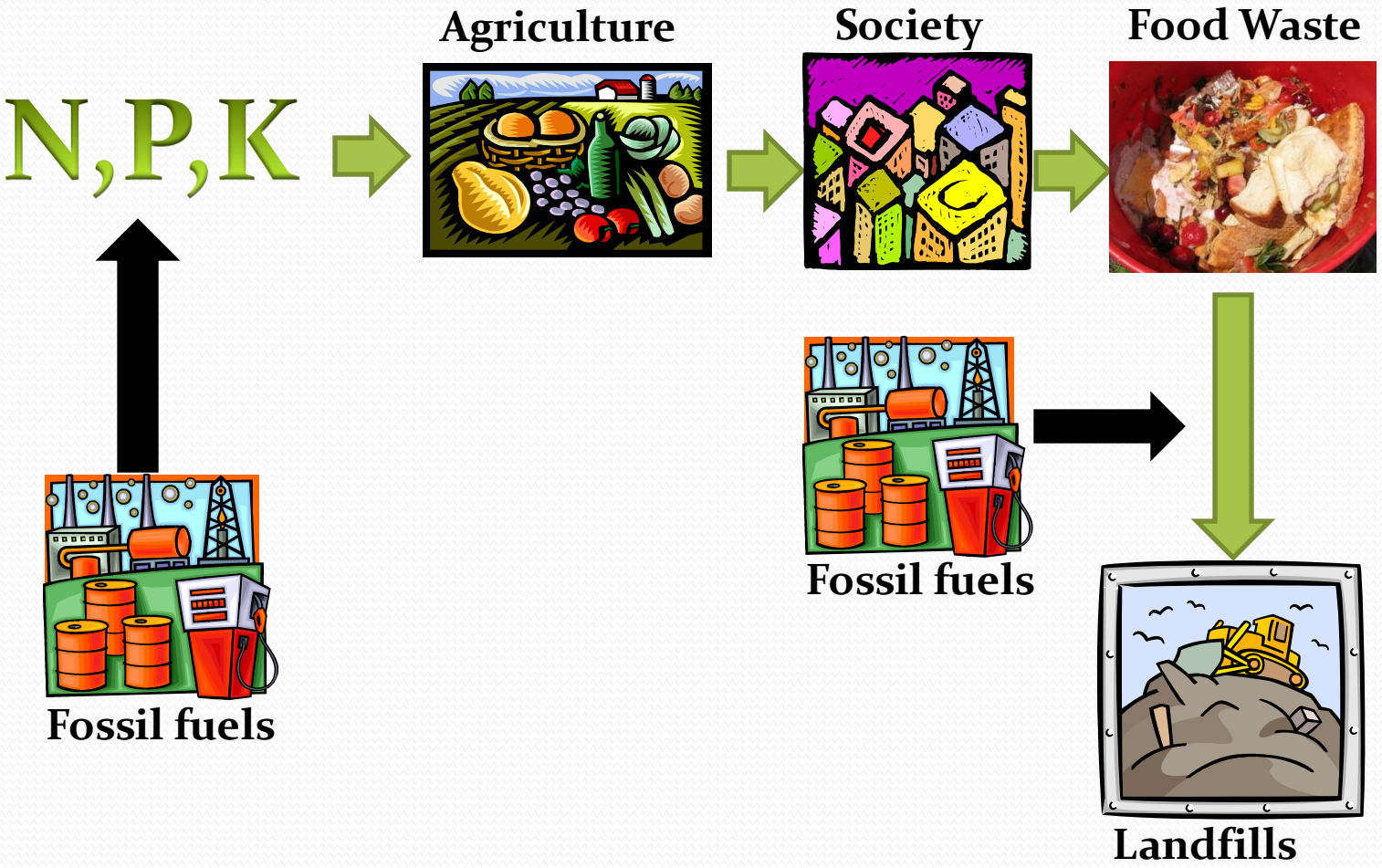
- Modern agriculture is dependent on fossil-fuel derived nutrients
- Nutrients are embodied in the crop
- Wasted food removes these nutrients from production and requires further fossil fuels to handle
- Organic fertilizers expensive for small farmers

Current food waste disposal

2008 Collection Data

- US: 31.8 million tons (EPA 2008)
- Florida: 1.7 million tons (FDEP 2009)
- Alachua County: 16,378 tons (FDEP 2009)

Current nutrient pathway



One solution: Anaerobic digestion

- AD is the microbial degradation of organic material under anaerobic conditions
- Produces biogas as an energy source
- Nutrients remain in effluent as source of “biofertilizer”

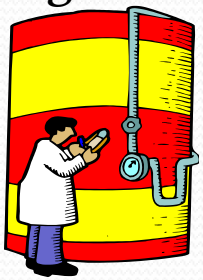
Closed cycle of food waste digestion

Agriculture

Society

Food Waste

Anaerobic Digestion



N,P,K

Methodology

- Food waste collected from local schools and University of Florida dining hall
- Acid digestion for Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP)
- Ammonia measured by ammonia-selective electrode method (Orion Model 95-12)

Nutrient content of food waste

	TKN*	**TP***
Cafeteria 1	2.324	0.285
Cafeteria 2	2.557	0.494
Dining Hall Plate Scraps	2.342	0.314
Dining Hall Kitchen Waste	2.481	0.351
Average	2.426	0.361

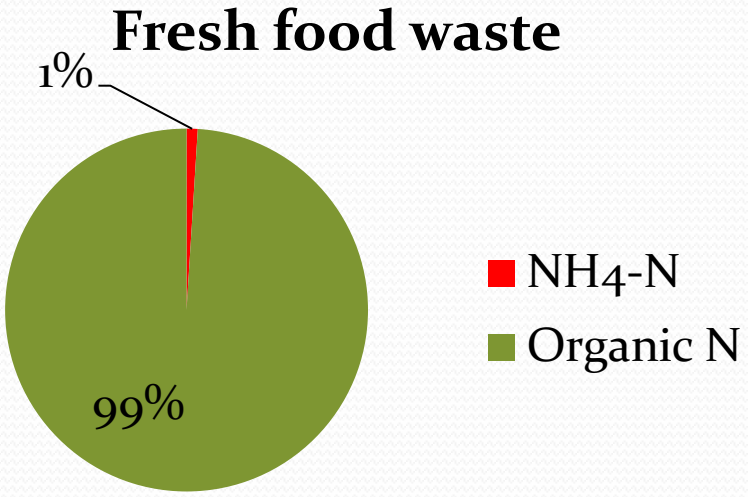
*As %DMB

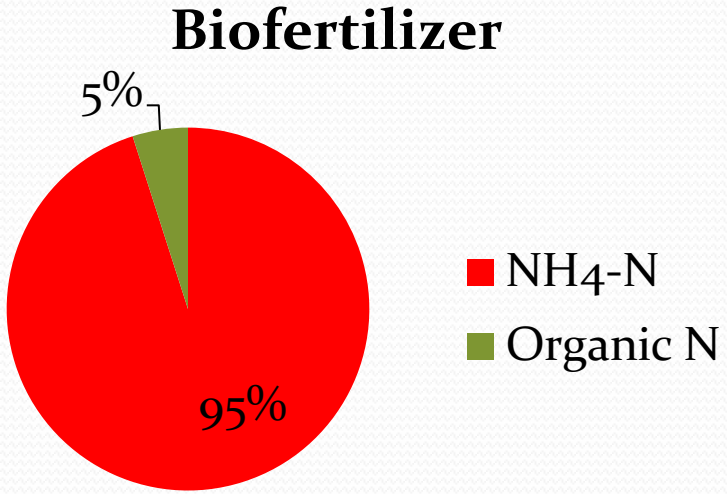
Nutrients from food waste

- US: 513.8 million lbs. N/year
  76.0 millions lbs. P/year
- Florida: 27.5 million lbs. N/year
  4 million lbs. P/year
- Alachua County: 265,000 lbs. N/year
  39,000 lbs. P/year

Nitrogen form

- Organic nutrients are mineralized during digestion process
- Organically-derived replacement for synthetic chemical fertilizers





Advantages of biofertilizer over composting

- Nutrients converted to plant-available form
- Can be injected into existing fertigation systems
- Avoids need for spreaders
- Can be diluted to required concentrations
- Ideal for small farms implementing organic agriculture
- Nutrients made available for urban agriculture

Integration with composting

- Biofertilizer can be incorporated into existing composting systems
- Low C:N ratio of biofertilizer improves biodegradability of high carbon material (e.g. woody waste, paper)
- Helps return carbon to soil

Conclusions

- Biofertilizer keeps nutrients within the productive cycle
- Food waste digestion is a cost-effective way of extracting nutrients and energy from wastes
- Promotes organic and sustainable agriculture

Questions?

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