Laboratory Animal Waste Management at FSU

A Pilot Feasibility Research Project

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Background Information

Annually, 100-200 tons of compostable soiled animal bedding from research laboratories are generated and sent to landfills by Florida State University. This contributes to methane emissions and pollution. Aerobic composting is an effective strategy at combating both emission and pollutant reductions of organic matter, but is also a form of sustainable carbon capture. This research project will determine the feasibility of diverting animal bedding waste from the landfill to a passive aerobic composing process. Such a process will utilize technology known as a Johnson-Su bioreactor, a type of low-maintenance, self-aerated compost bin that allows for little manipulation throughout the composting process. The goal is to produce a nutrient-dense, environmentally-friendly, safe, living soil amendment. Future experiments will include measuring the nutrient content and the species present in the finished product and functional testing of the finished product on plant growth and soil rehabilitation.

References

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- Averill C et al. 2022 Defending Earth's terrestrial microbiome. Nat Microbiol 7, 1717–1725. (doi:10.1038/s41564-022-01228-3)
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Methods

Pick up waste

i. Near the end of cage cleaning sessions, investigators will retrieve the bagged cage waste from LAR cage wash at the facility loading dock
ii. A hopper (0.5 cubic yards) of bagged animal cage waste will be transferred to the back of the vehicle with the tarp secured closed around bedding

Drive waste to site for immediate unloading

Unload at bioreactor site

Fill Johnson-Su bioreactor(s) (1-2 hours):

i. Don PPE at bioreactor size (latex gloves, goggles, gowns, N95)
ii. Unwrap tarp and open bagged waste
iii. Take samples for time zero analysis
iv. Take samples of water
v. Close the bags and distribute moisture
vi. Open the bags
vii. Confirm moisture level of adequate (35-45%)
viii. Transfer material into assembled bioreactor until full
ix. Cover bioreactor
x. Insert probes to monitor temperature and moisture levels
xi. Collect materials and wash with hose at site downhill from other projects
xii. discard disposable PPE

Check on bioreactor(s) after first few days

i. Don gloves and N95 mask
ii. Remove PVC air pipes
iii. Get temperature and moisture reading

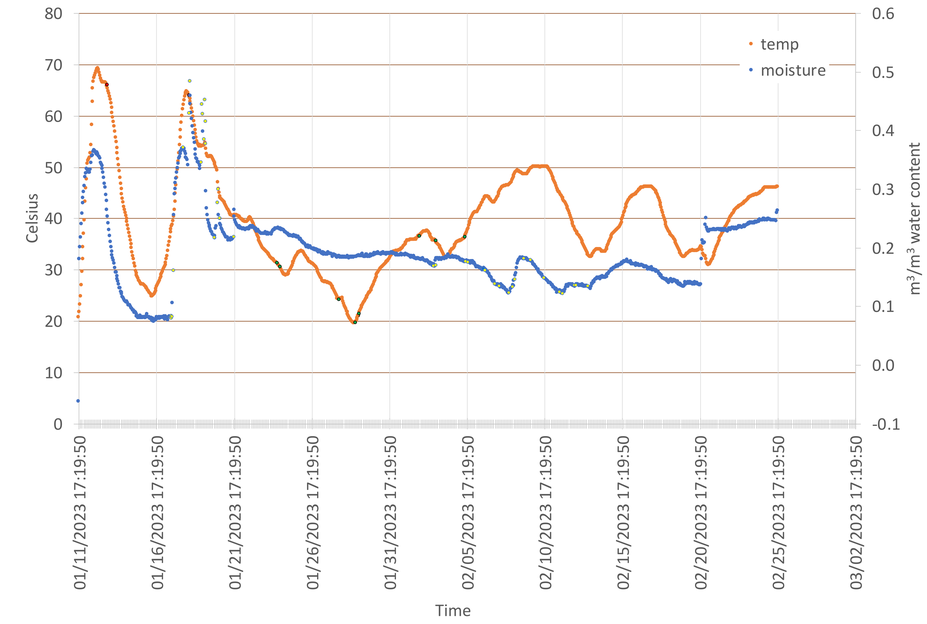
Monitor and sample for 9-12 months

i. Add water as needed to maintain moisture content
ii. After hot compost phase and temperature reduces to less than 80F (~27C), add composting worms
iii. A researcher will use a coring device to collect a sample from the bioreactor at 1/month frequency

Preliminary Findings and Future Plans

- The natural process of composting so far has resulted in a living specimen, seen in the heat signature and fungal growths
- Is currently still too hot to move to the next stage of composting which would be adding the composting worms
- The current estimate is that within the next calendar year we will have created and obtained a nutrient dense soil amendment and fertilizer replacement
- The hope is to eventually utilize such an output product on the plants at the FSU Biological Research Facility and Test the true success of such a product
- Need modified water system for the constant input of water needed to maintain ambient temp and moisture contents
- Second build will have such modifications and be utilized for coring samples with the hopes it will be more structurally stable for such data extraction
- Overall, the feasibility of such a project is considered a success

Observations



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