

Wish for WASH 2018-2020 Compost Research Project Reflection

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Some of 2018 Compost Research Team



The Compost Research Bins



Some of the 2019 Compost Research Team

BACKGROUND

Sanitation has been an integral part of community planning and continues to be the cause behind many issues around the world. It touches every part of daily lives such as cooking, cleaning, and community-building. Most contemporary research focuses on how to achieve and maintain sanitation in terms of keeping human-created waste away from the population. These methods, however, neglect the fact that waste can be useful and beneficial to the overall environment and can be used as a resource.

Most developed cities in countries like the United States have extensive sewer systems that carry waste beyond the community limits for treatment, but resource constrained communities - both in the US and globally- do not have such extensive solutions, resulting in excess pollution and a build up of pathogens that affects other part of society. **In fact, an integral part of maintaining sanitation is to determine a safe and hygienic waste removal method.** Another solution to maintaining sanitation is to recycle the waste that accumulates. Methods that involve recycling organic waste (particularly from a toilet) fall under the umbrella concept known as [Humanure](#), a widely used composting process.

Composting is a broad topic that can be neatly defined as the decomposition process of organic matter. Organic matter has an advantage over inorganic matter in that it can be easily broken down into critical components that are quickly recycled into

nature. For instance, breaking scraps of food into base components of nitrogen, carbon, and oxygen is much easier than breaking a glass bottle into the same base components. Composting itself is a beneficial process for the overall environment as it returns key elements to the ecosystem. Humanure returns human waste to the ecosystem, eliminating the need for extensive sewer systems.

Essentially, Humanure composting takes place in and around a composting toilet.

The process resembles a cycle of using the ecosystem to gather food, eating the food, expelling the food as waste from the body, and returning the waste to the environment to be composted.

There are plenty of advantages and disadvantages to Humanure composting. Some advantages include the inexpensive alternative composting toilets present. Composting toilets are cheaper, require less maintenance, save space, reduce the burdens on the existing system, and have minimal impact on the property. These reasons, coupled with how beneficial composting is for the environment, justify the effort it takes to complete the composting process. Of course, there are disadvantages that are equally important to consider. For instance, composting toilets are often known for their odor and user experience difficulties.

PURPOSE

The [Wish for WASH](#) compost research team conducted a project between 2018-2020 to determine if the variation of the carbon to

nitrogen ratio would increase the rate at which compost was created and would better ensure that the compost created would be safe to use in a garden or farm. Carbon and nitrogen are important elements that determine the composition of healthy fertilizer and soil in general. They are also essential for the survival of healthy bacteria.

EXPERIMENTATION

The purpose of this experiment conducted by the Wish for WASH compost research team was to develop a method that properly composts horse manure into natural fertilizer within a variety of carbon to nitrogen ratios.

Composting involves the biochemical conversion of organic waste products into reusable material. This material is most often significant in agriculture and used as organic fertilizer as it prevents the use of chemical-based fertilizers. Using four variations of the carbon to nitrogen (C:N) ratio, a constant volume of horse manure from the Dekalb Horse Farm, the temperature variations that the C:N ratios caused were measured. Temperatures never rose high enough to sterilize common bacteria species. The results indicate that a new method with increased C:N ratios will be necessary.

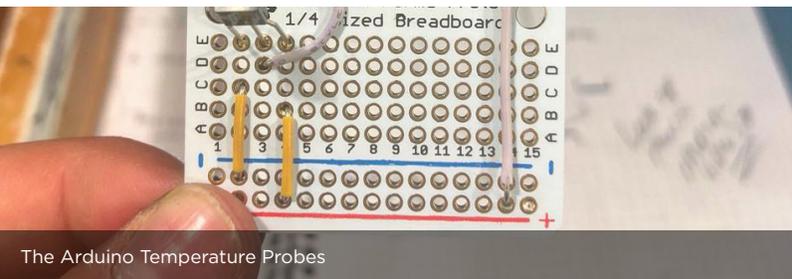
REFLECTIONS

Throughout this project, we were able to identify key areas of research design that we would like to improve upon for future research. First, while setting up the experiment, we would like to clearly defined the research question and goals. For instance, to improve the method of setting up the horse manure

at the [Dekalb Horse Farm](#) and putting in [Arduino](#) temperature probes, in the future we could gather the horse manure, test the C: N ratio already present and adjust the sawdust proportions accordingly to increase the rate of composting. **We believe that this would lead to a deeper understanding of how horse manure is similar yet different from human waste while also indicating a proper time frame.** When it comes to gathering data, having a proper time frame is essential. For the project, it was important to monitor the composting process at different temperatures. To improve this method in the future, perhaps a device could be used to simulate different temperatures and/or even air quality according to multiple areas where this project could be applied. These are just a few examples of improvements that could be done to the study design of similar research.

Future work for this design and methodology may involve the use of different bin materials, decreased ratios of C: N wherein more amounts of nitrogen are introduced, and a different method to measure the presence and activity of pathogens within the manure.

Overall, while we are still learning and growing in this work, we believe that its potential impact is significant. There are many people who are living without a way to safely dispose of their waste and or who are looking for ways to reuse their waste as a part of the [Circular Sanitation Economy](#); we hope that this continued research will help contribute to this sector's body of work. And who knows - perhaps in the future, the use of Humanure as a crop fertilizer will result in the return of lost biodiversity and increase sustainability in areas that currently lack access to sanitation!



The Arduino Temperature Probes



Some of the 2020 Compost Research Team and the Wish for WASH team at Large

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