Food Waste Reduction in High Schools

By: Trevor Broman, Mitch Wong, Ryan Doyle, Katherine Crossen

Abstract

In this AHP model, we found possible solutions to help reduce food waste in American high schools. We used the AHP modeling system to find our goal to eliminate or reduce the amount of food waste we see in United States high schools. After this, we connected our goal to our criteria which we then aligned with some subcriteria. We then went on to input some alternatives to achieve our goal into the AHP model. Some of these alternatives included a biodigester, composting, dehydrating, and a food rescue. With our goal and criteria in place and connected, we then went on to give input as to which criteria was more important from our point of view. By doing this, we were able to figure which options would be best to help achieve our goal while finding low amounts of inconsistency in the output we received.

The AHP processing model was beneficial to use under this scope of finding ways that different options compared to each other. We found how certain alternatives compared to each other. This process was vital in finding which alternatives would better serve our goal to reduce or eliminate food waste in high schools. This process was used to find a problem that can be simple or complex and apply the methods and ratings to find inconsistencies and make a decision based on the output. In our specific case, we found that the best alternatives in order were composting, food rescue, dehydration, and bio-digestion respectively . This is something that is used as a basic first-glance reaction to what the software says would be the best options based on our ratings.

Introduction

Food waste is something we commonly see each day. It is a huge problem we see in the high school system in the country. One shocking fact is that roughly 40% of food in America is wasted. When you break this down further, it equates to about $165 billion that are quite literally; thrown away. This is a massive loss of money that we see each year. While it has its monetary component, there is also an aspect of it not being sustainable to just simply throw away food. Food waste in the United States alone has a large problem with over preparing food and food simply being thrown away. While it is an issue, there is a program that has been put in place to serve the many high schools in the country. The National School Lunch Program (NSLP) helps to provide schools with ways to provide healthy and affordable lunches.

With the vast amount of food waste in high schools, there are better options of ways to deal with leftovers such as donating it to food shelters or finding more efficient ways to dispose of the food such as composting, a biodigester, and dehydrating the food. With these, it is a better option than just simply throwing food into a garbage system. With composting, there is a positive that stems from this being that foods composting can benefit soil health depending on the food. The dehydrating method is used to take the moisture out of food, thus the food is able to last longer as bacteria is not able to grow. Lastly, we see the biodigester as another option for reducing food waste. With this alternative, this machine works to break down food that is then able to be processed and used as fertilizer. This system essentially helps food return back to the earth and be used in farming to improve crop yields. With this, it creates a full circle of life for food.

We had looked into the alternative methods of reducing food waste and found that the

composting, dehydrator, and biodegrader were the best options to aid in this issue. When

making

our decisions, we kept in mind key factors such as cost, effectiveness, how it impacts the

community, and ease of implementation. For the most part we felt that these were some of the

most important factors. These are factors that for the most part should be considered with any

decision making. We found that two of the more important factors with solving this issue would

be the cost and implementation. The third most important would be the effectiveness of one of

these solutions. Along with the community aspect, we also found that another factor could be
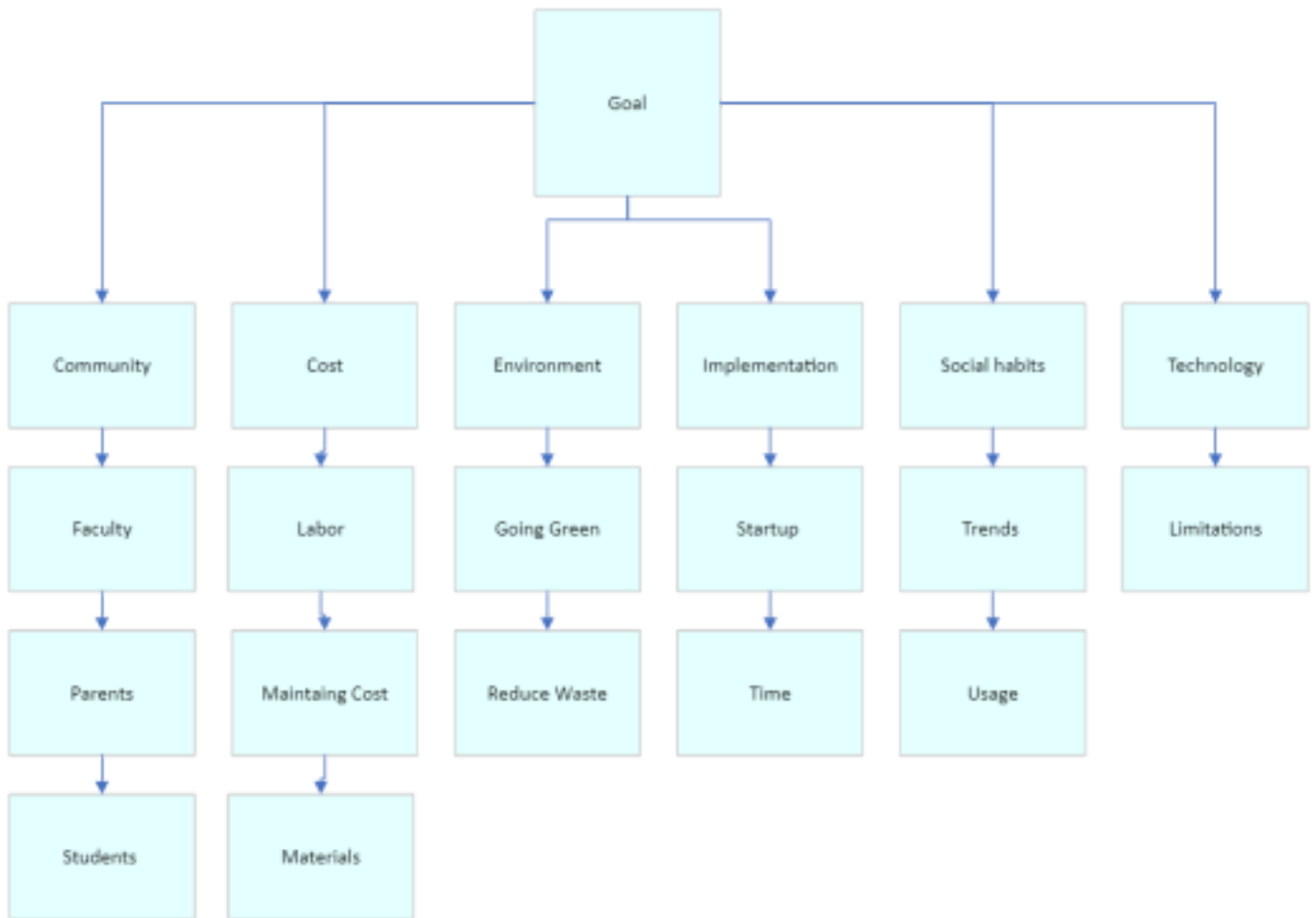
people buying into some of these ideas.

Methods & Approach

When discussing the methods and approaches the main aspect of our decision making process

was using the super decision application to help use software to eliminate bias and come to the

most sound decision. The group assessed some of the main criteria and subcriteria of the

different aspects of food waste primarily in high schools. Then there was an alternative node put

into the super decision which is where the judgment aspect of the super decisions started to take

place. The judgment aspect of super decisions was comparing the alternatives with some of the

criteria and subcriteria and then ranking the alternatives against each other and based on the

rankings composting was the best alternative for food waste in high schools. The criteria was

weighed and then used in a table to calculate the best alternative based off of a LoMedHi ranking

system. Using these results the next step would be to see the actual implementation process of

trying to input composting into high schools to try and eliminate food waste, this would involve

seeing total costs, community impact, environmental impact, and overall effectiveness. In real

world scenarios the approach would be to run a trial between one or multiple schools to see if

one this would be effective in eliminating waste and secondly seeing if the difference is

substantial enough to be considered for more schools. These were the methods and some

approaches that the group decided was best for this aspect of the AHP project.

Name	Ideals	Normals	Raw
BioDigestor	0.285977	0.139791	0.139791
Composting	1	0.488821	0.488821
Dehydration	0.18694	0.09138	0.09138
Food Rescue	0.572822	0.280007	0.280007

Table 1

Goal

Community	Cost	Environment	Implementation	Social habits	Technology
Faculty	Labor	Going Green	Startup	Trends	Limitations
Parents	Maintaing Cost	Reduce Waste	Time	Usage	
Students	Materials				

Community (0.1369)	Cost (0.0775)	Environment (0.1934)	Implementation (0.0364)	Social Habits (0.0183)	Technology (0.0375)
Med	Lo	Med	Lo	Med	Med
Hi	Hi	Lo	Med	Med	Hi
Hi	Hi	Hi	Hi	Hi	Hi
Lo	Lo	Med	Lo	Med	

Table 2

Application

The way we plan to apply ideas for helping to eliminate food waste is not only with the
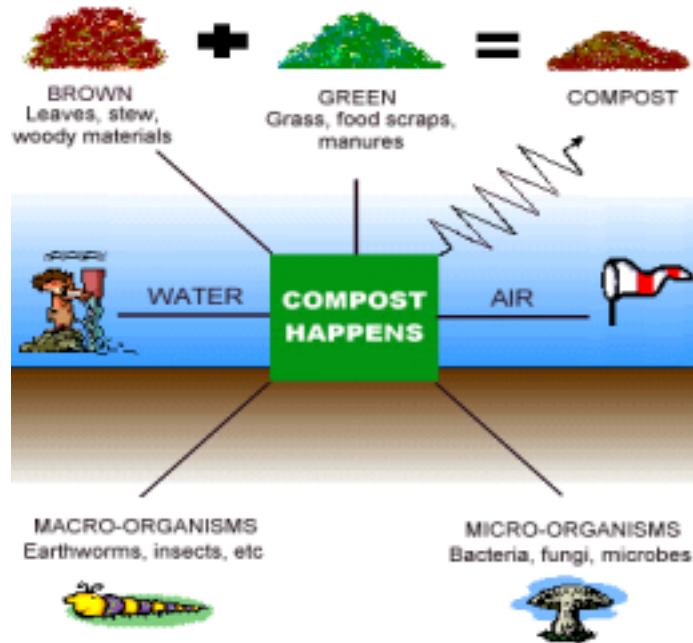
Figure 2

addition of a camposter but also with the use of data collection. To go along with using uneaten food in the composter there will be attendance taken in advance to lunch be prepared as to also help to avoid making an excess of food. That's why we have two methods to help eliminate the problem of food waste.

As you can see in the figure above composting does require some material other than food such as leaves, water and macro / micro organisms. However all of those items are very easy to find so if we set this up at high school we would have more than enough materials for this to be successful. This composting would help to create more and enriching soil to intern, help to grow more food and help to cycle of life much more. Another idea we wish to implement is a data collection system where we can plan on how much food is needed to be prepared in order to help limit excess food as well.
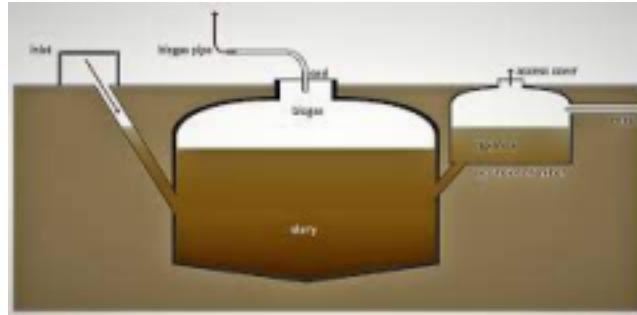
Figure 3

By taking attendance at the start of the day the school cafeteria can better prepare on how much food is needed for that day. High schools waste a lot of food that never goes in and if we can limit the amount of food that even gets made it could greatly help the problem of food waste. When extra food is also made, we plan to do a food rescue to make sure it does go to someone I need and does not get wasted.

By applying a composter, data collection and food rescue plan can be done very simply with one adding a simple composter and after lunch have either the students or staff take it to the composter. The data collection would be done by staff at the start of the day and then communicated to the lunch department. Lastly, food rescue would be applied by the staff to call someone to pick up the untouched food. That is how our plan to limit food waste could be implemented.

Results

After completing the pairwise comparisons, we found that composting was the best alternative for our criteria. With respect to costs, community impact, environmental impact, and overall effectiveness, composting was by far the best option. The second best option was food rescue, and the third and fourth options were biogestor and dehydration respectively. After analyzing our results, we realized that while composting is a great option for any food left on student's

plates after eating, the food that was not served could easily be taken to a food rescue and help

even more people. While composting is a way to decompose food waste, it also enriches the

soil where it decomposes. As a result, the area where the food decomposes could also be used

to grow natural ingredients that could be used by the school kitchen staff.

Because we were focused on sustainability with this project, environmental impact was

the most important criteria. Composting was the mostly environmentally friendly option because

it does not require any machinery that would pollute the environment. The only environmental

impact of a food rescue would be the gas used to drive from the school to the food rescue and

back. Both dehydration and biodigestion require machinery that would create pollution. Cost was

the second most important criteria because many schools do not have a lot of money and cost

could be a deterrent for poorer schools. The only cost of composting would be a chicken wire

fence to keep out unwanted animals. The cost of gas to and from the food rescue would be the

only cost of this option. Dehydration and biodigestion would both incur large costs at the onset

because of the cost of buying the machine and then would run up the cost of electricity for the

schools. Community impact and overall effectiveness were not taken into serious consideration

because they coincide with environmental impact and cost.

Conclusion

In conclusion, AHP was necessary to make the decision about which alternative was the

best option to eliminate food waste in high schools across the United States. After deciding on

our criteria and alternatives, we completed pairwise comparisons to decide the best alternative

between composting, food rescue, biodigestion, and dehydration. After analyzing our results, we

found the best way to reduce food waste in high schools was to use a combination of composting

and a food rescue service.

References

Research grants & projects. Environmental Research Education Foundation. (n.d.). Retrieved
    September 15, 2022, from
    https://erefdn.org/school-cafeteria-waste/?gclid=Cj0KCQjwmouZBhDSARIsALYcoupT1
    Rs6OeYPzQ_9gbAms46S-oL7MXhfBgCcjvb36gnnxpduyiWY3m0aAhCzEALw_wcB