Leela A. Raghavendran
Huron High School
Ann Arbor, Michigan
United States: Food Wastage and Environmental Sustainability
Impact of the School Lunch Program

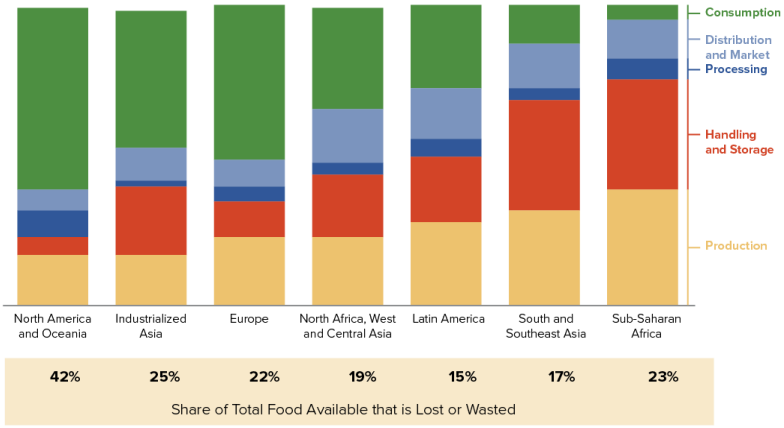
Introduction: I grew up in a near-zero food waste household. Waste not, want not is an indelible phrase etched into my memory from as far back as I can remember. My brother cringed as he ate his breakfast oats at lunch and dinner because he hadn't finished it when intended. My mother would chide us, "I do not slog over the stove for food to be dumped in the trash and no, you will smell and perhaps taste the milk (not read the expiration date) before you toss that". Did I mention that leftover food would be cleverly prepared into a "new" dish and presented with flair on the table? Think, day-old rice mixed with sautéed onions and eggs with a sprinkling of cilantro, and voila, we had egg rice for our school lunch! It is against this background that I observed the patterns of my schoolmates at lunch hour. I would see many of them fill their plates from the lunch buffet. They had to pick up the customary "vegetable" and fruit as recommended by the USDA. Shortly after exiting the lunch line, I would notice them dumping more than half the food in the trash, including a perfectly good-looking apple! If I knew them, I preached the ideology of "Waste not, want not". As I thought about these instances, I decided to research this problem and identify potential solutions. Our awareness that food wastage has a direct impact on environmental sustainability has led to attempts to help reduce wastage, but more needs to be done. These solutions are to be undertaken at multiple levels with the intended goal of implementing various fixes for this global problem. The goal of this essay is to understand the intersection of food wastage and environmental sustainability, particularly as it relates to the school lunch program in the United States.

I. Country: United States (US): The US was chosen for its large size, population, and sizable impact on the global problem of food wastage. The population of the US consists of 331 million people (1). In 2020, 57M people were living in rural areas compared to 272M in urban areas. The government is a federal, constitutional, democratic republic. This means that the President, Congress, and the Judiciary share their power to run the US government. The federal government shares sovereignty with the state governments. The major food-related exports are grains/feeds, soybeans, livestock, and horticultural products (2). While the land area covers nearly 2.3 billion acres, the proportion of the land base for agricultural use has declined from 63 to 51% from 1949 to 2007 (3). The USDA states that the average farm size in the US is approximately 444 acres (4); equivalent to 13 times the area of the Pentagon (5). The climate and geography vary throughout the US; it is considered mostly temperate but is tropical in Hawaii and Florida, arctic in Alaska, semiarid in the plains west of the Mississippi River, and arid in the Great Basin of the southwest (6). The average family size in the US has declined from 3.7 in 1960 to 3.15 in 2020 (7). The average number of people/households in the US is 2.53(8). The average American diet consists of excess sodium, saturated fat, refined grains, and calories from solid fats and added sugars (9). Most American families get their food from supermarkets. Most Americans are meat-eating (beef and chicken). A typical meal for most involves a meat item, a starch, and a vegetable. Potatoes or pasta are the common starches. Leafy greens (salad) are the most common vegetable source (10). Many families in the US face multiple barriers that prevent them from obtaining nutritious food. "Barriers to healthy eating included lack of time and competing priorities; cost of healthy food, adjusting habits to favor a healthier diet (11). Paradoxically, the US leads the world in "consumed" food wastage (see Figure 1)

II. Challenge of Food Wastage: Globally, about 1.3 billion tons of edible food, or about one-third of the mass of edible food produced for human consumption, is annually lost or wasted. Food wastage across the life cycle from food production to consumption results in a colossal $750B loss (12). Moreover, food wastage results in a carbon footprint of 3.6 Gigatons of CO_2. If food wastage were a country, it would be the third-largest emitter in the world, after the USA and China (13). The hierarchical model of food is complex, and each step lends itself to the modification that can reduce food wastage, resulting in a

sustainable environment (14). Interestingly, the intervention steps in the life cycle of food vary according to the socio-economic status of countries. For example, wastage occurs most often during production and storage in poorer countries and during consumption in richer nations (Figure 1). *As a high schooler in a large public school, I will focus on school lunches as a source of food wastage and provide recommendations to reduce the carbon footprint resulting from school lunch wastage.* Specifically, I undertook to shadow the food service director at 2 public schools in my county and I will use lessons learned from my experience and the Covid pandemic to direct my recommendations.

Figure 1



IIa. School Lunch Program: School lunches remain a crucial component of public school programs in the US and go a long way in tackling the problem of food insecurity. Most of America's schools participate in the National School Lunch Program (NSLP), which provides low-cost or free lunches to over 20 million kids a day. The NLSP was signed into law in 1946 by President Harry S. Truman. At the time of inception, the US was recovering from the great depression and there was a need to not only educate millions but also provide food security. To this day, this program serves as a lifeline to students; there are 22 million children from 97,000 schools who participated in this program for the years 2017-2018. Students from families with incomes below 185 percent of the poverty level are eligible for free or reduced prices in the NLSP. Students from families reporting income between 130 and 185 percent of the federal poverty line are eligible for reduced-price meals, while children from families with incomes below 130 percent of poverty are eligible for fully subsidized or "free" meals. The eligible number of students from K to 12 in the state of Michigan who are eligible to participate in these programs were 733 and 710, for the years 2019 and 2020, respectively. About 50% of these eligible students participate in the program. In Huron High school, where I attend school, about 40% of students take part in the school lunch program.

During 2020, I often thought about my classmates at school who receive not only lunch but also breakfast as part of this extended program. I was therefore happy to note that the program continued in some form throughout the pandemic for families in need. For a while there, my focus shifted from my observations of food wastage in my high school cafeteria that I had observed in the years before the pandemic! More on that now.

IIb. School lunch food wastage, how bad is the problem? What is the impact? Did you know that the average person in the United States wastes the equivalent of 1 lb. each day? This reflects 26% of the school lunch budget (15). **Economic Impact:** The World Wildlife Fund- Food wastage warriors program estimates that **food waste** in schools across the country could be as large as 530,000 tons and could cost as much as $1.7 billion each school year (16). If all the schools in the NLSP reduced their waste by an average of 3%, an estimated $52 million could be saved per year. U.S. school food waste totals 530,000

tons per year and costs as much as $9.7 million a day to manage, which breaks down to about 39.2 pounds of food waste and 19.4 gallons of milk thrown out per school per year (17).

Environmental Impact: School lunch wastage has a direct effect on environmental sustainability. Wastage of consumable food at our schools is like the patterns of food wastage reflected in global statistics. Let's analyze this a bit further. Take the apple tossed out by my high school classmate and let us trace its journey to the plastic bag-lined dumpster. The impact on the environment is seen at every stage of the life cycle. As an example, an apple orchard uses water, pesticides to grow apples (**Figure 2**). The trucks that carry these apples from the orchard to the processing factory utilize fuel. In the processing factory, the imperfect apples are tossed, while the perfect ones are washed, dried, and stamped. Energy is required to operate such plants and the trucks used for distribution. The apples arrive at the local grocery stores. Trucking and unloading, refrigeration to preserve the crispness and quality of the apples further contribute to greenhouse gases; The apples are bought in bulk by schools for distribution at lunch. Apples are either eaten or tossed into the dumpster; methane is released by apples tossed in a plastic bag in a landfill. Now, imagine this entire process in the life cycle of other wasted foods!

Figure 2

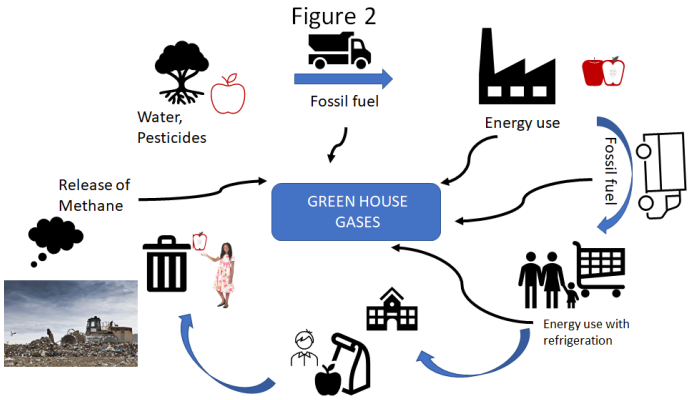
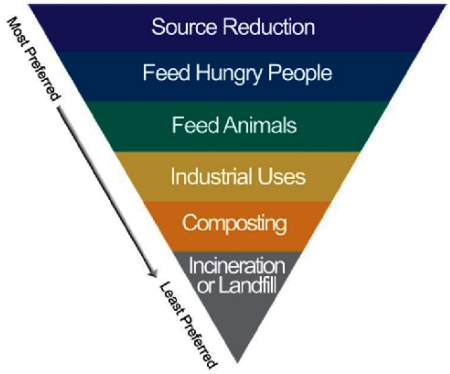


Figure 3
Food Recovery Hierarchy



Social Impact: This issue impacts our world because from a food security perspective the attempt to reduce food waste could be a strong opportunity to decrease the calorie gap that concerns where we are now vs. where we need to be, to sustainably feed the planet. A study suggests that the world currently faces a 70 percent gap between the calories produced from crops today and those that will be needed to feed a projected population of more than 9.5 billion people in 2050 (18). Retrieval of wasted food has the potential of reducing this gap and improve food security. This implementation is without any additional environmental costs.

III. Potential Solutions and points of interventions: Points of intervention to reduce food waste are summarized in **Figure 3**. Food waste prevention remains the most direct intervention with immediate effects on environmental sustainability. The other steps that include food recovery (from unconsumed foods) and redistribution as well as landfill management are more complex and not always environmentally friendly solutions. Specifically, concerning school lunches, I will focus on the prevention of wastage as well as food recovery and redistribution at an individual, school, state, and federal government level. I will use what I observed in 2 urban schools during the Covid (2020) pandemic to inform my recommendations.

IV. Barriers to implementing programs to reduce school lunch wastage: In summary, the barrier to implementing programs to reduce school lunch wastage involve unsupportive school policy, undesirable food quality, satiation, and social influences (19). Therefore, strategies aimed at improving food preparation and taste, allocating more time for lunch, allowing sharing of lunch, and saving the leftovers are appropriate solutions.

V. <u>Recommendations</u>: My preliminary research findings point to a balance between the need to tackle food insecurity and food wastage.

Individual/Student level: A report from the Centers for Disease Control and Prevention found that children and adolescents got 13.8 percent of their daily calories from fast food (from 2015-2018), up from 12.4 percent (from 2011-2012 (20). This data portrays the number of kids who are resorting to fast food for their meals instead of hearty, healthy alternatives. Not only will this negatively impact their health, but this results in a narrow palate and food experience. The highly processed and salty foods become their idea of "food".

Estimates of vegetarians in the school-age groups vary from 2-5%, depending on the source of the data (21, 22). This suggest that the majority who do eat meat likely prefer it over fruits and vegetables. *If the school and/or families tried to integrate fruits and vegetables in the kids' meals from a younger age, their palate would be more diverse allowing them to eat a healthier meal at school.* The relationship between increased fruits/vegetable consumption and reduced food wastage is more complex and non-linear.

School Level: Policies at the school level can tackle the school lunch wastage problem. One solution is RBL (**Recess Before Lunch)**. Strohbehn and others elaborate on the benefits of moving recess times to before lunch to decrease the amount of food wasted at lunchtime (23). *Data support my proposal of imposing RBL on younger children who will likely be hungrier and finish their whole meals*. Findings from this study also support the importance of offering food items preferred by children; it was clear certain vegetables did not appeal to this group of third graders, regardless of service style or district characteristics. Since recess is only a small solution and primarily only employed in elementary schools, another could be *schools enforcing families and/or students to fill out weekly forms scheduling and confirming days the children will be eating at school*. High-level data is required to identify students in need. This data needs to be translated into an electronic registration method.

While shadowing the food director in my county, Karen Thomas for Lincoln High School, it was explained how Lincoln was utilizing this solution to manage how many meals to make for food distribution during the pandemic. It was also evident that the number of meals and wastage decreased with the use of *foods that could be safely stored and reused*. We discussed the impact of how COVID forced school cafeteria programs to improvise and observe new ways to distribute food, a more environmentally efficient method. These lessons can be carried over post-pandemic to reduce food wastage. Our high school, Huron, employed similar solutions to track the number of meals and reduce wastage.

State Level: Health and physical education, the two mandatory classes are required by the state of Michigan for one to graduate high school. But where is *<u>food education</u>*? Isn't learning about food and where it comes from just as important as learning about one's own body? All schools should make it mandatory to offer a class about the food cycle and supply chain. Other measures to increase awareness may include a *<u>school garden</u>* managed by the students. Additionally, parents of elementary school and preschoolers could be educated about food; after all a large part of what we eat is influenced by what is cooked and consumed at home. The *<u>way the cafeteria's food is prepared</u>* and where the food comes from is also an important part of how the food tastes. If a dish is not properly prepared, not many people will want to eat it, let alone picky third graders, and most will waste it. During my visit to Lincoln High School, I learned how schools get their ingredients from verified vendors and how most of it is pre-prepared food like pre-cut veggies, chicken nuggets, etc. These large vendors likely use mass-produced food items. In the book *The Fate of Food* by Amanda Little, there was a reference to how food is food, no matter how it looks. "*<u>Buy mottled or misshapen produce</u>*: it tastes just as good and it's probably better for you than the perfect-looking stuff" (24).

Therefore, I additionally propose that schools should start buying from local sources. Not only will the produce be fresher, but this will also help the local economy, apart from reducing carbon miles.

Sourcing food from local grocery chains that value food wastage and redistribution is key. As an example, the Michigan-based grocery chain Kroger has made significant strides since 2018 to reduce wastage from their stores and redistribute baked goods, milk, vegetables, and fruits to local shelters (25). They also provide a shelf for misshapen fruits and vegetables at a lower price. Schools could source their lunches from such companies and use their redistribution systems as another way to reduce waste. Using surplus fruits grown in Michigan: for example, cherries that don't make the cut into dessert pies for school lunches: tasty and less likely to be wasted!

National Level: The value of food wasted in America each year has been estimated at between $162 billion and $218 billion (24). That is an enormous amount of money that is being wasted. The first step to reducing food wastage is ***prevention***; before we try any other solution, our citizens should be educated and taught to prevent food wastage. We also need to employ other solutions. One such solution pertains to *laws that allow companies, schools, etc. to redistribute their food* without the threats of lawsuits. A study described the negative impacts resulting from the USDA standards, in that 60 percent of the vegetables and 40 percent of the fruits were discarded. Another study found an overall increase of 56 percent in wasted food as a direct result of the USDA mandate (26). In California, a law signed in 2017 will allow schools to donate uneaten food to charities in the state. Under the new law, public schools can give their unopened packaged food, unopened milk cartons (kept cold), and uncut produce, like apples, to food banks and other charities. It is time for such policies to be nationally implemented. It will reduce the amount of food wastage significantly because the food that gets wasted at schools can be redistributed to those in need.

COVID offered solutions in the US: Can we use lessons learned during the Covid Pandemic? Across the country, school lunch programs had to retool to meet the demands of not only school children, but also toddlers at the homes of these families who often ran out of food. But the number of lunches prepared fell dramatically. For example: On an average school day before the coronavirus, Cleveland County Schools cafeteria staff would prepare over 13,000 lunches (27). During the peak of the pandemic, schools produced roughly one-quarter of what they are used to, creating some financial strains for school nutrition (27). This led to a ripple effect on food service workers, vendors, and food producers. However, there was far less wastage.

The school lunch program continued through the pandemic in our state of Michigan. The following steps were taken. a) Students were asked to register using an App (This results in meals being prepared only for a set number of students each day). b) Packaging of food in biodegradable containers and raw materials supplied to families as easy ways for in-home consumption and reduce wastage.

Conclusions: **1)** Wastage from school lunch programs has a significant economic, social and environmental impact on a global scale. **2)** It is all connected; one apple that my classmate threw away will negatively affect our delicate ecosystem. **3)** However, there exist real actionable solutions at an individual, school, state, and national level that we must initiate to lessen the effects of food wastage on a sustainable environment while maintaining food security.

Bibliography

1. Plecher, P., & 6, J. (2021, January 06). United States - total population 2025. Retrieved March 30, 2021, from https://www.statista.com/statistics/263762/total-population-of-the-united-states/
2. Agricultural trade. (2021, August 20). Retrieved March 29, 2021, from https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/agricultural-trade/
3. Nickerson, Borchers, C. (2012, March 1). How is land in the United States USED? A focus on agricultural land. Retrieved March 30, 2021, from https://www.ers.usda.gov/amber-waves/2012/march/data-feature-how-is-land-used/
4. U. (2019). Farms and Land in Farms. Retrieved March 29, 2021, from https://www.nass.usda.gov/Publications/Todays_Reports/reports/fnlo0220.pdf
5. The measure of things - 444 acres. (2021). Retrieved March 29, 2021, from http://www.bluebulbprojects.com/MeasureOfThings/results.php?comp=area&unit=a&amt=444&sort=pr&p=5
6. Briney, A. (2019, October 12). Why the USA is one of the most Influential nations in the world. Retrieved March 29, 2021, from https://www.thoughtco.com/geography-the-united-states-of-america-1435745#:~:text=Like%20its%20topography%2C%20the%20climate,Great%20Basin%20of%20the%20southwest.
7. Department, P., & 20, J. (2021, January 20). Average family size in the US 1960-2020. Retrieved March 29, 2021, from https://www.statista.com/statistics/183657/average-size-of-a-family-in-the-us/#:~:text=As%20of%202020%2C%20the%20U.S.,reflected%20in%20the%20decrease%20of
8. Department, P., & 20, J. (2021, January 20). Average size of households in the U.S. 2020. Retrieved March 29, 2021, from https://www.statista.com/statistics/183648/average-size-of-households-in-the-us/
9. Stephens, H. (n.d.). Issues. Retrieved March 29, 2021, from https://www.uab.edu/inquiro/issues/past-issues/volume-9/82-the-effects-of-an-american-diet-on-health#:~:text=The%20Dietary%20Guidelines%20for%20Americans,products%2C%20and%20oils%20than%20recommended.
10. Gardiner, T. (2014). What do American families cook at home on regular days? Retrieved March 29, 2021, from https://www.quora.com/What-do-American-families-cook-at-home-on-regular-days
11. Seguin, R., Connor, L., Nelson, M., LaCroix, A., & Eldridge, G. (2014). Understanding barriers and facilitators to healthy eating and active living in rural communities. Retrieved March 29, 2021, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4276670/#:~:text=Barriers%20to%20healthy%20eating%20included,of%20Time%20and%20Competing%20Priorities.
12. Goossens, Y., Wegner, A., & Schmidt, T. (2019, September 23). Sustainability assessment of food WASTE Prevention measures: Review of Existing Evaluation Practices. Retrieved March 29, 2021, from https://www.frontiersin.org/articles/10.3389/fsufs.2019.00090/full#B33
13. Goossens, Y., Wegner, A., & Schmidt, T. (2019, September 23). Sustainability assessment of food WASTE Prevention measures: Review of Existing Evaluation Practices. Retrieved March 29, 2021, from https://www.frontiersin.org/articles/10.3389/fsufs.2019.00090/full#B33 **(FAO 2015)**

14. Oyenuga, Bhamidiarri, A. (2015, November). Construction and Demolition Waste: An Opportunity or a New Challenge? Retrieved March 30, 2021, from http://www.ijirset.com/upload/2015/november/7_Sustainable.pdf
15. Nargi, L. (2019, April 9). Millions of dollars' worth of food ends up in School trash cans every DAY. what can we do? Retrieved March 30, 2021, from https://ensia.com/features/school-food-waste-solutions/
16. Gingerella, B. (2019, December 10). Schools produce 530,000 tons of food WASTE ANNUALLY, new study estimates. Retrieved March 29, 2021, from https://www.foodservicedirector.com/operations/schools-produce-530000-tons-food-waste-annually-new-study-estimates
17. Rosa, S. (2019, December 06). Report: U.S. school food Waste NEARS 530k tons annually. Retrieved March 29, 2021, from https://www.k12dive.com/news/report-nations-school-food-waste-may-be-as-much-as-530k-tons-annually/568599/
18. Lipinski, B. (2018, September 26). What's food loss and waste got to do with sustainable development? A lot, actually. Retrieved March 29, 2021, from https://www.wri.org/blog/2015/09/what-s-food-loss-and-waste-got-do-sustainable-development-lot-actually
19. Zhao C, Panizza C, Fox K, Boushey CJ, Byker Shanks C, Ahmed S, Chen S, Serrano EL, Zee J, Fialkowski MK, Banna J. Plate Waste in School Lunch: Barriers, Motivators, and Perspectives of SNAP-Eligible Early Adolescents in the US. J Nutr Educ Behav. 2019 Sep;51(8):967-975. doi: 10.1016/j.jneb.2019.05.590. Epub 2019 Jun 20. PMID: 31230949.
20. Sandoval, K. (2020, August 14). Kids in the U.S. are eating more fast food, the CDC reports. Retrieved March 29, 2021, from https://www.nbcnews.com/health/kids-health/kids-u-s-are-eating-more-fast-food-cdc-reports-n1236756
21. How many teens are vegetarian? How many kids don't eat meat? (n.d.). Retrieved March 29, 2021, from https://www.vrg.org/journal/vj2001jan/2001_jan_teen.php
22. Stahler C, Manels R. Vegetarian Resource Group. How many youth in the U.S. are vegan? How many teens eat vegetarian when eating out? 2021. Available at: https://www.vrg.org/nutshell/Yougov2021youthteenwriteup.pdf (Accessed on March 24, 2021)
23. Strohbehn, C. (2015, November 30). Impacts of scheduling recess before lunch in elementary schools: A case study approach of plate waste and perceived behaviors. Retrieved March 29, 2021, from https://eric.ed.gov/?id=EJ1103061
24. Little, A. (2019,2020). The Fate of Food. New York, NY: Harmony Books.
25. Little, A. (2019,2020). Stop the Rot. In The Fate of Food (pp. 194-214). New York, NY: Harmony Books.
26. Linnekin, B. (2017, October 07). States fight back against USDA rules that cause school food waste. Retrieved March 29, 2021, from https://reason.com/2017/10/07/states-forced-to-fight-back-against-usda/
27. George, D. (2021, February 19). School lunch program feels the impact of the pandemic. Retrieved March 29, 2021, from https://www.shelbystar.com/story/news/2021/02/19/school-nutrition-costs-revenues-down-because-pandemic/6718696002/