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China, Spoilage and Waste

Food waste and undernourishment in China

China's undernourishment rate in 2018 was 2.5% (The World Bank Group, n.d.) and this rate may seem small at first but because of China's massive population of roughly 1.393 billion people in 2018 (The World Bank Group, n.d.), it means that around 34,825,000 people in China were undernourished at the time. While millions of people do not have enough to eat, China has been wasting or losing more than 35 million tons of food every year, which would be enough to feed roughly 60 to 100 million people (Piesse, 2017) and it is 6% of China's food production (Marchisio, 2020). For comparison, it is estimated that the United States wasted roughly 63 million tons of food in 2018 (United States Environmental Protection Agency, 2021). Despite China wasting more than half as much food annually compared to the United States' wasted food in 2018, China's population consisted of over 1.4 billion people in 2020 (United Nations Statistics Division, n.d.).

I have lived in Puerto Rico for 8 years, I am currently living on the United States mainland, and I come from a middle class family: I have never struggled to obtain access to food so I do not know what it is like to be malnourished. However, while there may be many people like me who waste food at times and do not have to worry about malnutrition, there are millions of people who do not consume enough nutrients.

Most, specifically 60.31%, of China's total population lives in urban areas (ProQuest, 2021). On average, families have two children (ProQuest, 2021) but "most families still only have one child" because the one-child policy lasted for a few decades and ended in 2015 (ProQuest, 2021). Urban families in China are often composed of parents and one child while some rural Chinese families have a few generations living in the same home (Encyclopædia Britannica, Inc., n.d.). Rural families usually live in larger homes than urban families but rural homes "may lack running water and other amenities" (ProQuest, 2021). However, access to different types of food is generally limited to what is grown in the family's region unless it lives in one of the larger cities (ProQuest, 2021). The foods that are eaten by families in China tend to be "made with rice, potatoes, cornmeal, tofu, and various grains" and foods with meat in them, specifically "pork, beef, chicken, or fish", are expensive but commonly eaten (ProQuest, 2021). It is also mentioned that families in China "may eat frequently at local restaurants" (ProQuest, 2021). An issue that non-urban families in China may face is additional difficulty in getting into well-paying jobs in cities if they do not have urban registration permits (Encyclopædia Britannica, Inc., n.d.). This may disrupt access to quality food because if it is harder for a family to find jobs that allow it to make a proper amount of money, the families may need to resort to purchasing cheaper food to save money.

A key factor that leads to food waste in China is improper storage (Piesse, 2017). An article titled "The Wasteful Dragon: Food Loss and Waste in China", stated the following: "More than half of China's total grain production of 609 million tonnes is stored in farmer households. These facilities are generally in poor condition, leading to the loss of more than 20 million tonnes of food, mainly due to insects, moulds and birds" (Piesse, 2017). In addition, an administration of the Chinese government suspects that one-third of China's grain storage facilities is outdated and inadequate. (Piesse, 2017). If the storage facilities were modernized, the food that is currently being lost could be used to feed most of the undernourished people in China.

Another factor that contributes to food waste in China is an aspect of China's culture. An article titled "Xi Declares War on Food Waste, and China Races to Tighten Its Belt", stated the following: "Custom dictates that ordering extra dishes and leaving food behind are ways to demonstrate generosity toward one's relatives, clients, business partners and important guests" (Huang & Qin, 2020). This may mean that taking the uneaten food or only ordering the necessary amounts of food for a group could be considered selfish actions and could discourage some people from taking them. This is harmful to food security in China because following this mentality may turn people's focus away from the undernourished people and it may encourage people to waste more food to appear to be more generous (Cheong, 2020).

The reduction of food waste is important and it is not only because that food could be given to people who are undernourished, it is also because food waste is very harmful to the environment. According to the Food and Agriculture Organization of the United Nations, it is estimated that an equivalent of 3.3 billion tons of carbon dioxide in greenhouse gases are emitted annually because of food waste (Food and Agriculture Organization of the United Nations, n.d.). For comparison, India emitted 2.65 billion metric tons of carbon dioxide in 2018 which made it the country with the third-highest carbon dioxide emissions at the time and those emissions were from "Fuel combustion only" (Union of Concerned Scientists, 2020). In addition, a report mentioned the following: "...when organic matter decomposes in an oxygen-free environment, it releases landfill gases such as methane, which can cause environmental, hygiene, and safety problems" (Zhang & Zhang, 2018). Methane is a greenhouse gas that is 84 times as powerful as carbon dioxide over the course of 20 years (Climate & Clean Air Coalition, n.d.).

A solution to the food waste issue that China's government is currently attempting to use is called the 'clean plate' campaign (Huang & Qin, 2020). The purpose of this campaign is "To reduce food waste and alleviate hunger" (Sheldon, 2020). This campaign involves relying on the public population to concern themselves with "the issue of food security" (Kanthor, 2020). The article may also have some explanation for why the campaign started: Xi Jinping, the leader of China, said "The pandemic, mass flooding throughout China, and trade tensions with other countries all highlight the need to protect the country's food supplies" (Kanthor, 2020). This campaign did not include specific instructions on solving the food waste issue.

The Chinese government's campaign has not been executed well: an article that was published on the CNN website mentioned "...[Xi Jinping's] directive lacked specifics, leaving it up to zealous officials and citizens across the nation to engineer sometimes drastic methods to tackle [food waste]". The absence of basic standards or a singular way to reduce food waste in this campaign can result in inconsistency with the methods used and their effects on food waste and people. The "drastic methods" that were used include but are not limited to the local government of Shanghai telling people to report each other for overeating or wasting food, with the punishment for these "[offenses]" being left unmentioned, a local government in one of China's provinces using surveillance in "government canteens" to discourage wasting food by humiliating people who are "caught on camera with food waste more than three times", and a restaurant in China wanted to weigh its customers in order to try to help them with their meal choices. These attempts at reducing food waste to comply with the campaign do not seem to take the public's opinions about these ideas into account and people may see these methods as excessive intrusions into their lives (Westcott et al., 2020).

There is another solution to the food waste issue in China that would work better than China's campaign: reusing food waste (Commendatore, 2019). There are various methods of using the food waste instead of disposing it, including the creation of new food products from wasted food (Commendatore, 2019), using food waste as fertilizer or compost (Commendatore, 2019), and generating electricity (Piesse, 2017). Fertilizer and compost made from wasted food could be used to grow the crops that undernourished people need to eat in order to correct and maintain stable diets. Another benefit from this solution is that people would not feel like the Chinese government is taking more control of their lives because their eating habits would be left unchanged. Considering the custom surrounding ordering additional dishes in China, leaving people's eating habits unchanged also avoids interfering with the nation's culture. Leaving people's eating habits unchanged would not decrease the annual waste production which means that most of it would need to be collected and reused for this solution to be effective. However, this solution may be more efficient if sorting waste is promoted and expanded on in China: as of 2017, more than half of China's municipal solid waste is food while it is less than 30% in "many developed countries that have well-established waste sorting processes" (Piesse, 2017).

This solution would involve a national awareness campaign that would explain why reusing food waste is important to the public, businesses that need or are willing to help, and other entities. The purpose of this campaign would be to inform the public and promote reusing food waste instead of merely disposing it. Surveys would be sent out to the public every six months in order to gather the public's opinions surrounding the campaign and use them to alter aspects of the campaign as needed. The information would be distributed through electronic mail and in the form of pamphlets sent as physical mail to make sure that people who lack access to computers can receive the information. The information in the emails and pamphlets would specifically explain how people can help increase the reuse of food waste in their communities. Considering China's population of over 1.4 billion people in 2020 (United Nations Statistics Division, n.d.), attempting to inform them all may be very expensive, would be very difficult, and there is a risk of some people being skeptical or rejecting the information.

A grain storage facility modernization program (The World Bank Group, 2020) could either be used as an alternative to reusing the wasted food or alongside it. This solution would involve identifying how many grain storage facilities (including farmer households) are inadequate and updating them. Since this solution would be another one that does not involve changing people's eating habits, people would not feel like the Chinese government is imposing more restrictions on them. However, this solution would still result in the wastage of some of the food that was "saved" because of the improved storage facilities. The amount of undernourished people that could be fed with the saved grains is also limited because some of their diets may lack nutrients that are absent from grains.

A combination of the two previously mentioned solutions may be the best solution to the food waste issue. The grain storage modernization program's lack of action regarding the possibility of "saved" food being wasted in homes or stores would be alleviated by reusing significant amounts of food waste. If the grain storage modernization program saved most, if not all, of the roughly 20 million tons of annually lost grain (Piesse, 2017), there could be enough grain saved to feed millions of the undernourished people.

While there are tens of millions of people in China who are in need of proper nutrition, China's population is wasting enough food every year to feed entire countries' populations and more than enough to feed its undernourished population (Westcott et al., 2020) (Marchisio, 2020) (Piesse, 2017). The Chinese government is attempting to reduce food waste with its Clean Plate campaign, yet some excessive measures have been used by restaurants and other entities because it does not provide specific

instructions regarding food waste reduction. The food waste issue can be solved by using the large amounts of food waste that are produced each year to produce fertilizers and compost in order to grow the foods that undernourished people need. Another possible solution is a program to find and modernize the inadequate food storage facilities in China to reduce, if not end, China's annual grain loss. A combination of reusing food waste and modernizing China's grain storage facilities may be an optimal solution because reusing food waste could compensate for the flaws of using a storage modernization program alone and neither solution imposes restrictions on the country's population.

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