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China, Spoilage and Waste

China's Food Waste Problem

Have you ever wondered what happens to your food when you throw it away? Have you ever thrown away food and thought it was no big deal? Well, in China this is a very big deal. In the following paragraphs, I will be explaining to you about why this is a growing problem in China and the solutions I have come up with to help China with this problem.

As I stated earlier, the country I have chosen is China. One of the biggest problems in this country is food spoilage and waste. While this country is developed, it has a very big problem with wasting usable food. China is, in fact, so developed that it has the biggest population of any country in the world at 1.379 billion people. Unlike the United States, China has a fairly even urban to rural percentage at 51.27 percent of people living in an urban setting, and 48.73 percentage of people living in a rural setting. China's average family is 3.1 people per household, and the average house is only 600 square feet, about half the size of an average middle class home in America. The average person in China makes about 4,755 dollars or 32,387.2 yuan. (Kuo Lily, The average Chinese private-sector worker earns about the same as a cleaner in Thailand). This person however, has a good diet for their income level. Most of their diet is based on vegetables and starches, like rice and wheat, but they also use some meats such as pork and fish. While these families have access to school and education through the government, medical care is very expensive in China. Most of China's civilization has access to fresh water except those living in rural areas. Of China's 48.73 percent of rural people, 34.54 percent of people do not have access to clean water or they do not get clean water in a sanitary way. China is also facing another problem, people do not have enough money to buy food while providing shelter for their family. It was found during a 2009 to 2011 study that 6% of the people do not have enough money to buy food, but at the same time, 14% of people also can't buy shelter for their family (Srinivasan Rajesh, Steve Crabtree, Poorest Chinese See Better Access to Food, Shelter).

The people of China waste 17 to 18 billion tons of food each year. This is enough food to feed 30 to 50 million people (Rui Zhang, Research shows huge food waste in China). But you're probably thinking: why does this matter if we are talking about food waste? Well, that is the problem, it is estimated that China wastes this much food each year, which is 6% (Tristram Stuart, Pg 199-201) of all the food they produce on the average .6 heca acre farm, which is less area than a rugby field. It's not just the thought of people wasting food, it's the thought that China has about 9.6% of their population or 135,844,409.088 people. This doesn't only affect the people of China, it also affects the environment by "overflowing landfills with 73% of Chinese food waste ending up in them" (The Collective, China's Food Waste Challenge). All this waste ending up in landfills creates methane, a highly toxic and flammable substance. It creates so much methane that the total release is twice the amount of total CO2 emissions on all U.S. road transportation. This does not only affect China's air quality, but the amount of greenhouse gases in the global atmosphere. Wasting food is not only bad for the environment, but also increases operating costs, and the cost to consumers at the same time. As stated by *The Collective*,

“wastes on all sides of the supply chain increase operating costs and as a result, prices for the end product increases with consumers shouldering the cost” (The Collective, China’s Food Waste Challenge). As a result of China’s food waste, prices for operators and consumers increase, the environment is harmed, and resources are not used to their full potential.

China wastes enough food each year to currently feed all of the people living in South Korea. This is in large part to the diet they eat on a daily basis. “Vegetables top the list of food waste occurring at the consumer level and account for as much as 29% of the total.” (Hui, Liu Food waste in China could feed 30-50 million: Report) “The institute newly revealed survey indicates staple foods, like rice and noodles, and meat are two other main sources of food waste, representing 24 and 18 percent of the total, respectively.” (Hui, Liu Food waste in China could feed 30-50 million: Report) Not only is this bad, but consumers from cities throw away about 93 grams of food per meal, while more food is wasted at school cafeterias and restaurants. This food waste not only hurts China “by 2012, the equivalent of 1.6 Earths were needed to provide the resources and services humanity consumes each year” (Hui, Liu Food waste in China could feed 30-50 million: Report). By 2013, campaigns were launched such as “eating up and clean your plate” to help solve China’s food waste problem. This campaign was launched when a school teacher noticed that her students were throwing away large amounts of food. This is due to China’s dining culture, that if you have food left on your plate and if you have more than you actually need it’s something to be proud of and gives a sense of security. Once again, this shows that China needs to change its dining and eating culture if China’s food waste problem is ever going to get better. This is not only good, but also encourages other efforts to be launched and educate the next generation that waste is shameful according to Professor Cheng Shengkui, Principal Investigator of The Institute.

How is China going to solve its food waste problem? There are many ways that China could solve its food waste problem, including the use of maggots, new technologies with ideas already in use in Denmark. One interesting way that China could solve its food waste problem is through the use of black soldier fly larvae farms. Many of these farms have already been popping up in China’s Sichuan province. Sichuan’s capital city is Chengdu, which hosts a commercial waste collector determined to help get rid of China’s food waste problem. This commercial waste collector is Chengwei Environment which collects trash from over 2,000 restaurants in Chengdu. Chengwei Environment then sell the food waste to Hu Rong for use on her Black Soldier Fly Larvae Farm also known as BSFL Farms, according to *Maggots Eat Away China’s Food Waste Problem at Fly Farms Across the Nation* written by AFP, May 2017. According to *The Black Soldier Fly How-to-Guide* by UNC Institute for the Environment, the following conditions need to be met in order for BSFL Farms to be as efficient as possible. Those conditions are temperature, humidity and other environmental conditions. “Temperature - The optimal temperature at which BSFL consume their food is around 95 °F. The minimum temperature for survival is 32 °F for no more than four hours, whereas the maximum temperature allowing survival is 113 °F. The larvae will become inactive at temperatures less than 50 °F and temperatures higher than 113 °F, where their survival decreases dramatically. The best range of temperature for the larvae to pupate is from 77 to 86 °F. For mating purposes, optimal temperature is around 82 °F (Zhang, 2010)” (Zhang J, Huang L, He J, Tomberlin JK, Li J, Lei C, Sun M, Liu Z, & Yu Z. (2010). “An artificial light source influences mating and oviposition of black soldier flies, *Hermetia illucens*.) Humidity - Black soldier fly larvae develop most rapidly at 70 percent humidity. The rate of weight loss for the BSFL increases with decreasing humidity. The optimal humidity for black soldier fly mating is around 30 to 90 percent. It is very

important to monitor humidity for captive rearing and breeding. We found that it is especially important to keep the grubs' feeding medium at a proper moisture level—not so dry that it cements the grubs into the feed, and not so wet that they cannot breathe through the pores in their exoskeleton. Other Environmental Conditions - BSFL do not survive well in direct light or in extreme dry or wet conditions. They prefer to be 8-9 inches deep in their food source. If they are too far below the surface, they will perform little bioconversion. Female flies avoid any sites that are anaerobic when trying to lay eggs. As shown by a table on www.CurrentResults.com, the average high temperature in Pengshan, China is 78 °F. The average low temperature is 65.5 °F. The average humidity is 73% as shown by a graph on www.timeanddata.com. Hu Rong's farm is located near Pengshan, and according to my research, this is an ideal place to have a BSFL farm based on temperature and humidity.

Due the annual salary in China and the cost of starting a maggot farm, the Chinese government will need to be open to providing funding to start maggot farms. To start a medium scale maggot farm, you need a BioPod, which is a pre-made grub tub system at the cost of \$200.00 or 1362.24 yuan. You can make these yourself at a cost of \$60.00 or 408.67 yuan per tube as stated in *The Black Soldier Fly How-to-Guide* by The UNC Institute for the Environment. A grub tub system is a collection of tubs where maggots are kept and fed organic matter and food waste. To start your farm, you also need some maggots. Maggots can be purchase at www.phoenixworm.com. At phoenixworm.com you can purchase 600 small maggots for \$27.95 or 190.44 in Chinese Yuan. Based on the salary figures I provided earlier and the numbers I just provide to start a maggot farm, the average Chinese citizen is unable to start a maggot farm without assistance from the Chinese government or another outside source. It takes up to 16% of the average salary in China to start a maggot farm, leaving even less for the average family to live on.

“On average 1 kg of maggots can eat 2 kg of rubbish in 4 hours” (Rong Hu, How maggots can put mountains of China's food waste to good use.) The maggots will help get rid of the food, but will also have many different uses. One of these would be to use maggots as live or dry feed for animals such as chickens, fish and turtles. The maggots can also make use of the proteins and fat still present in the waste and return them back into the human food cycle. “Recycling food waste may offer an economic benefit as well as environmental ones. Hu makes a comfortable living selling live black soldier fly larvae and fertilizer.” (AFP, How Maggots Can Put China's Mountains of Food Waste to Good Use) This not only helps China get rid of food waste, but also helps them produce more food.

As of the beginning of 2017, China has begun to take steps to reduce their food waste through the use of new technologies. With the use of data collection in “cafes they can for instance help a company cut down on waste by determining how many customers are in the building to eat and what they are likely to order by identifying which dishes are popular on a given day” (cnsmedia.com, China takes on new strategy on reducing food waste). This not only helps companies save money by them not having to buy as much food, but also keeps food waste out of landfills and reduces the amount of greenhouse gases. If every eatery in China's big cities uses this technology, they can cut back on food waste tremendously. What if Chinese citizens start to help solve the food waste problem? “Consumer education... [And] supermarkets offering steep discounts on food nearing its expiration or bearing cosmetic flaws” (Cremer, Justin Can the solution of our food waste problem be found in Denmark?) By educating people on the problem of food waste, they will be discouraged from wasting food, while at the same time be encouraged

to buy food that would soon be wasted. Through the use of a Facebook campaign named Stop Wasting Food, “has spearheaded well over 200 specific food waste reduction projects since 2008 and as a result more than half of Danish consumers say they now think more about their food consumption and waste.” (Cremer, Justin Can the solution of our food waste problem be found in Denmark?) Through these two ideas Denmark’s food waste percentage has dropped below 25% and continues to drop and “the country’s largest retailer, Dansk Supermarked, said it is throwing away only half of the bread it was five years ago and has cut fruit and vegetable waste by 20%” (Cremer, Justin Can the solution of our food waste problem be found in Denmark?)

“Trying to educate consumers about food technology is often a waste of time, says Joseph Zhou, an investment partner at China’s first food technology VC and accelerator. He says that it’s better tasting food that will solve China’s big food issues – safety, waste, and sustainability. [Bits x Bites \(the “x” is pronounced as “and”\)](#) is a Shanghai-based technology accelerator and VC firm that focuses entirely on food technology, but finds in China that it is best not to mention the technology to the eaters of the final products. “Food is emotional. Food has the power to convince people, so you don’t want to have tech overpower the food,” Joseph explains.” (Hersey, Frank How better tasting food can solve China’s food problems) Bits x Bites has found through their research that there is food waste all along the supply chain – at the farm and in the fridge. One place they found food waste was in the cold supply chain, which see a large overlap with food safety issue. Even though there are refrigerated trucks to transport the produce, Zhou finds that many times the companies have their employees turn the refrigeration off about a half hour after picking up the produce to save money. They then turn it back on just long enough for the produce to feel cool when it arrives at the warehouse or store. To solve this problem, Bits x Bites is hoping to invest in a remote cold sensors. These sensors would track the temperature of the produce on its journey from farm to table. There is another place that food waste occurs in every home whether you are in China or in the US, food waste occurs in every fridge. In an attempt to solve this problem “[An Israeli Company called Phresh](#) has developed a powder to put in the fridge that slowly vaporizes to kill bacteria, making produce last up to three times longer.” (Hershey, Frank How better tasting food can solve China’s food problems) This powder could go a long way in solving the food waste problem worldwide, but at the same time could have a negative effect on farmers. If vegetables are lasting three times longer, than farmers are going to sell less vegetables over the course of a season resulting in less profits for the farmer. Along with less profits for the farmer, the farmer could also experience above average food waste while he adjusts his supply to meet the new demand.

Today I have highlighted, in my mind, one of the biggest problems facing China in their daily world. “Each year, China produce a total of 40 million tons of food waste – the equivalent weight of 110 Empire State Building.” (Rong Hu, How maggots can put mountains of China’s food waste to good use.) This equals about 44kg (97lb) of food per person in China, although this seems like a lot the worse offender for food waste in the world is Australia. “In 2017, Australia wasted the largest amount of food per person. Australians threw away around 361kg (795lbs) of food per person.” (McCracken, Maggie Which Countries Waste the Most Food?) “In a 2011 report the FAO said that if food waste were a country, it would rank behind only the US and China for greenhouse gas emissions.” (Rong Hu, How maggots can put mountains of China’s food waste to good use.) Through the solutions I have given, China can start to cut down on their food waste in areas such as farming, manufacturing, marketing and consumption. This will not only help in saving the environment, but will provide the Chinese people with

better quality food. In return, the Chinese people will start to spend less on food, therefore giving the average Chinese citizen more money to live on. Above all these things, China needs to look at changing its dining and eating culture, this may cut back on food waste quicker than any of the solutions I have mention above. I believe, that the solutions I have provide, are the most important solutions for China to think about with the growing population in the upcoming years.

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