

Edible Packaging Design (Vegetable Paper)

Packaging plays a key role in modern life. Most products expire or become damaged before they arrive at the store if they are not packaged in some way. However, packaging is often considered to be a major hindrance to environmental sustainability, as many packages are designed for a single use. This is why companies in multiple industries are trying to minimize the negative impact of packaging on the environment without sacrificing the benefits of packaging. When dealing with the challenges of sustainable packaging, the most common response is to make the packaging easier to recycle, or to incorporate more recycled materials into new packaging. I believe another option is to create packaging that will not even need to be recycled. I want to address the challenge of edible packaging. My design idea is to find a way to break down and use fruit or vegetables to make packaging pulp, which can then be made into a wrapper for use in fast food restaurants. In fact, this could replace a number of current single-use packages. This could help us make a big jump in our effort to use sustainable design.



In the summer of 2015, I was working in packaging design at Nike, Inc. I visited a Nike store in Osaka where I met Ms. Kimura, a fellow packaging designer. Ms. Kimura was a young mother who designed crayons made from wild vegetables (recycling these discarded fruits and vegetables and refining them into powder, then adding rice oil). Her original goal was to prevent accidents caused by children eating wax crayons. As it happened, she discovered that in modern capitalist society, there is more than sufficient produce overstock because of “defective produce,” or produce that did not grow in the standard shape. Consumers would not buy this sort of produce even though it may be perfectly safe and have no difference in taste.

This idea of defective produce gave Ms. Kimura inspiration for her project, and now has also inspired me. When I returned to Osaka in 2017, I contacted Ms. Kimura and learned about her method. I told her about some of my ideas and she was happy to help. Based on her recommendation, I visited a company in Nagasaki called ISLE (アイル), which developed a new product called VEGHEET. ISLE had developed a method that transforms fresh vegetables into seaweed-like flakes. It not only helps solve the problem of food waste but can also serve as emergency food in the face of disasters. VEGHEET attracted attention among Japanese people that wanted to be prepared for a natural disaster. In addition to the complete preservation of the color and taste of the food, the vegetable flakes could also be used to assist in the production of a wide variety of foods. For example, you could use whole vegetable slices to wrap the ingredients like a burrito, and of course you could replace seaweed to make sushi. VEGHEET itself can be stored for more than a year.



While solving the problem of wasting food, it is also possible to introduce problems that cannot be overcome by so many fresh vegetables. Although they did not disclose much technical information, this visit allowed me to bury the design inspiration for designing edible packaging. In my ideals, the future food should be environmentally sustainable, and more importantly, let humans care for nature!

In early 2018, I contacted the department of Food Science & Human Nutrition at The University of Illinois at Urbana–Champaign (UIUC). After a semester of research, we discovered how to make vegetable paper. The challenge was in making the paper durable enough to be useful without using more resources than it saved. We used carrots, tomatoes, celery and other vegetables, which are cooked and slurred. Then we use a food additive, such as starch, and a homogenizer to make the vegetable juice more viscous. Then it goes into the oven.



It may sound easy, but the process is actually quite difficult. First, you need to extract vegetable enzymes, which will be solidified after cooking, and then choose the most suitable coagulating gel. It is a challenge to determine the correct proportion for mixing. Then pouring the pulp is difficult because of how quickly the pulp will flow before it solidifies. Finally, we learned to use the Chinese method of producing tofu. We used cloth as a filter and a wood base to finally solidify the vegetable pulp into flakes. Although this was an experimental result, it was a successful first step.



This is the beginning. It consists of rotten tomatoes, carrots and celery. We can also use corn, sweet potato, cucumber, bean sprouts, or other vegetables that are nearing the end of their shelf life. We were able to create some preliminary prototypes, after which I began to experiment with different designs. The cylindrical style is a relatively successful design because it is relatively strong and can be loaded with more product. It is possible that this experiment could lead to a

replacement for some restaurant packaging, such as for french fries, apple pie, or even the advertisements on the plate.





In developed countries, the number of ugly or damaged fruits and vegetables can account for 40% of total production. While some of this will be made into animal feed, most of the ugly fruits and vegetables will eventually be discarded. About 300 million tons of food are wasted every year in the world, and one-fourth of them are fruits and vegetables that are needlessly discarded. It may be difficult to sell, but abandoning it in vain is extremely wasteful. On the other hand, there is significant waste from packaging materials. There is an opportunity here for sustainable design. This is what I want to achieve. This experimental project is a start, but it is only the first step. Therefore, I hope to apply for the sustainable design grant, so that this project can continue to be developed and finally become a reality to replace the original packaging.





Packaging made out of vegetable paper is the future goal. There is a lot of opportunity and the market is ready for a sustainable solution to replace single-use packages. Eventually we will be able to make cartons and packages that can carry food or other objects, then be discarded and easily decompose to achieve a 100% sustainable lifecycle. We can use this for more than food as well. Shoe boxes are another opportunity for vegetable paper to play a role in spreading sustainable design practices.