



#rebite

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Every year, approximately half a billion pounds of fruit loss are generated by restaurants in New York City.

The Rebite project addresses fruit loss by repurposing excess fruit into innovative dishes and beverages with young adult chefs, offering meals to the Rebite community, people who seek to improve fruit loss systems. Doing so transforms these young adults into zero-waste chefs, reduces the fruit loss generated by commercial kitchens, and increases conversations around responsible waste management from commercial kitchens.

— By Qianshang Chen and Zongliang Shang



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SEEKING THE SEED

—PROBLEM FRAMING





"The most significant features for commercial kitchen are efficiency and quality, which generate more fruit waste(loss). For example, efficiency means chefs cannot cut fruit carefully and slowly, so many big pieces of fruit will be thrown away along with fruit peel or core."

— a head chef from commercial kitchen

Fruit Loss > Fruit waste

Each year, one-third of all food produced for human consumption is lost world-wide. Food loss refers to all food produced for human consumption but not eaten by humans. Food loss is defined as “the decrease in quantity or quality of food”.

Food waste is part of food loss and refers to discarding or alternative (non-food) use of food that is safe and nutritious for human consumption along the entire food supply chain, from primary production to end household consumer level.

We chose fruit loss for our thesis topic instead of fruit waste throughout our thesis. Because our solution is about creating new dishes for people to eat, and eating loss is much easier for eaters to adopt.

The Problem of Fruit Loss in New York

From USDA study data, New York city waste 3,341,100 pounds of fresh fruit every year. While, New York City restaurants, 45,681 of them, in total, account for the largest single stream of fruit loss on the commercial side. They generate close to a half million tons of fruit loss per year – enough to fill well over a hundred subway cars per day.

As such, the restaurant sector represents the greatest commercial opportunity to reduce the volume of New York City’s landfilled fruit loss.

—PlanNYC, government report

Problem Framing

– Research methods: interview, observation, field trip experience

Interview

In order to dip into the fruit loss issue, we interviewed various stakeholders who represent food supply chain, such as **farmers, intermediaries, supermarkets, retail stores, restaurants, customers, freeganisms, waste collector**, etc.

We interviewed **farmers** in Greenmarket, and realized that most of them don't think they waste fruit. If they cannot sell all their fruit or once the fruit starts to rot, they will compost them, and generate fertilizer for next plantation. What about the apples and peaches that get soft from customers picking them? Or the apples that get damaged in transit? They all get transformed and repurposed into apple cider, apple jam, or peach jam. **This creates a closed loop for fruit waste.**

In one of the big chain supermarket, we interviewed a **supermarket's employee** who was picking the ugly and damaged fruit from the goods shelf. He told us that he was going to throw this fruit to the dumpster. Moreover, he told us that they generate waste before the goods go on the shelves. For example, they open a banana box, they inspect the condition of the bananas first. If most of them is in good condition, they would stock up most of the bananas, removing only the damaged ones. However, if about half of the bananas don't look good enough, they would throw away the whole box, because it cost too much time and labor to sort out the bananas. **Making sure every fruit is in the "perfect" condition is their jobs and the company's policy.**

However, they also still have some methods to reuse some of the fruit, for instance, by cutting mango and pineapple into fruit combo bowls to reduce waste. They also said some fruit generate more fruit waste than others, for example, banana is one of the problematic fruit. Customers only want to buy light yellow(mature) banana, but they cannot import yellow banana because of their short shelves' life. Therefore, in summer, many banana are thrown away, because they rotted by the effect of temperature and humidity. **According to our interview, around 25 boxes of banana need to be thrown away each day.** In addition, the workers feel really bad and powerless about what they did.

We also interviewed Jisung—a **manager of a retail store**, he said that 15% fruit waste will be thrown before putting on the goods shelf, 90% fruit waste is caused by customers behaviors and aging.



"I lived in a low income area when I was a child. We did not know where was our next dishes. So, I feel bad about what I did. BUT, I have to work here and follow our company's policy to throw fresh and edible fruit, in order to support my family."

— A employee from a big chain supermarket



Observation

In the Greenmarket, we saw that each stall has at least one trash box which is full of damaged and rotten fruit. Countless fruit have been dropped on the ground by customers picking, and no one cares about them. Some of the customers don't treat the fruit "politely" during picking, such as pinching, scrape or dropping. After several round of customers, the fruit become ugly or bruised, and the farmers have to put them into the "one trash box". In the compost bin, we saw a volunteer was cutting the fruit and vegetable to small pieces in order to help them compost faster. Many people keep their food scrap in refrigerators, and bring them to the compost sites when it open. There are all kinds of fruit in the compost bin, but many of them still looked fresh, beautiful and edible.

In the big chain supermarket, we saw employees were picking the damaged and not perfect looking fruit to throw into trash bag. They check every fruit on the tables every 30 minutes, to make sure all the fruit are looking perfect.

In one of the commercial kitchen, we saw the whole process of making applesauce: peel the apple, then cutting it into four big pieces, throwing the big core and peel with many pulp into the trash can. If the apples are bruised, they threw it directly. After cutting one box of apples, they only get a bowl of apple pieces. The rest of them are all fed the trash can instead of human. Chef used orange peels to make cocktail for their dinner party, and the rest the oranges are just kept into refrigerator without other usage. Then, the pulp dried and rot fast because they no longer have the orange peels to protect them. Considering the flavor and appearance of the dishes, the chef won't use all parts of fruit. For example, lemon, the most common used fruit, some kitchens only use the middle of it to decorate dishes, because of the aesthetic looking. In term of the rest of lemon, throw them away!



A fresh apple that we collected from the compost bin at Union Square Greenmarket

What did we do?

In order to dig deeper into this problem, we met a group of people who do dumpster diving regularly in New York City. We call them **freeganism**. We begin at the Wholefood market at 95 E Houston St, then we went to many trash sites in the East Village area. **We are so surprised by the quantity of items and what we found, such as flowers, fruit, fast food, ingredients, books, stationery and even electrical appliances.**

After this unique experience, we decided to do dumpster diving by ourselves. **We found 12 pounds of food waste in one trash bag outside of a commercial kitchen.** According to open data sources, New York City has 45,681 restaurants. If every one of them has a trash bag like this, we assume that we will waste more than 700,000 pounds of food every day.

What is Dumpster Diving and Freeganism?

Dumpster Diving:

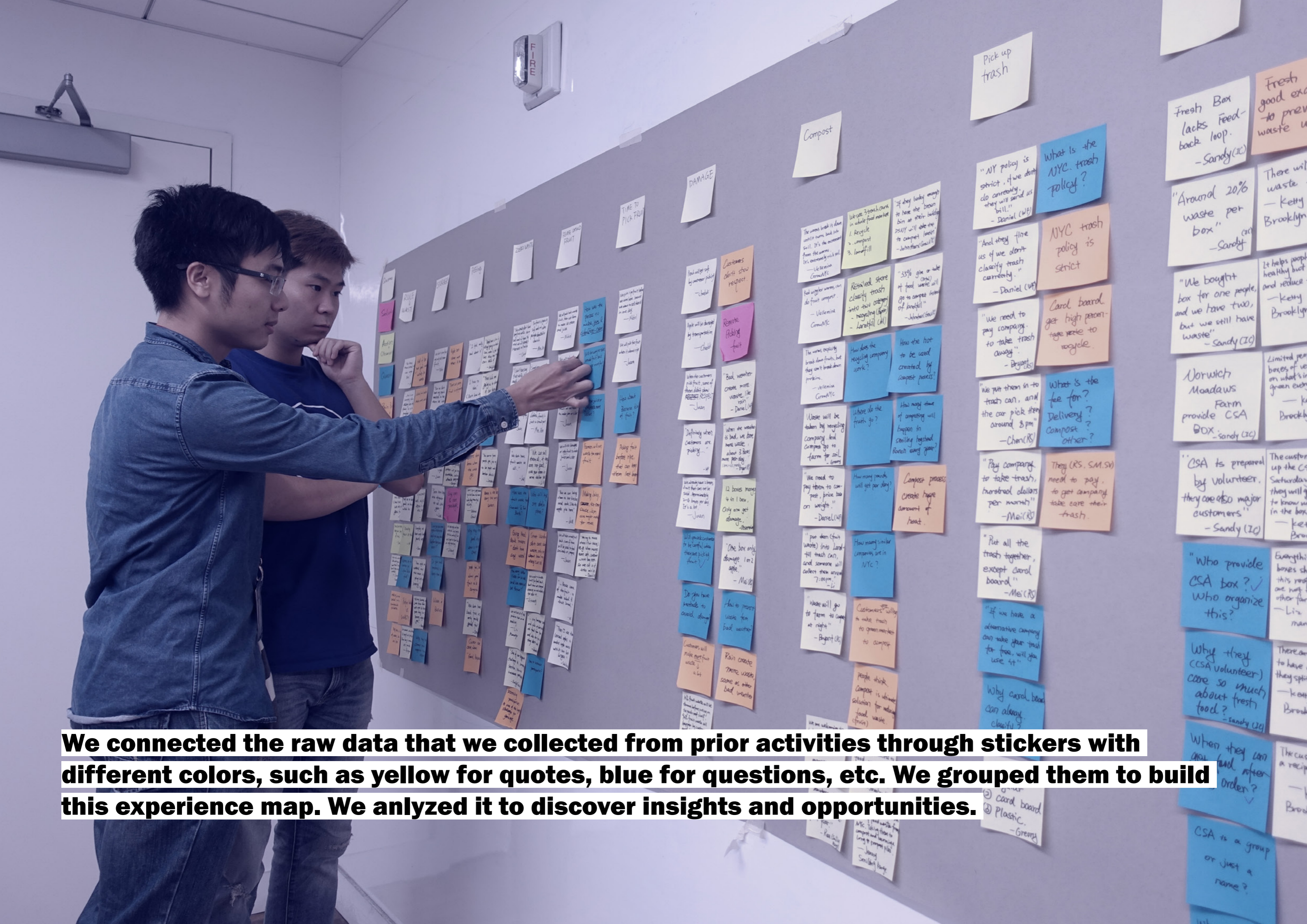
Dumpster diving is looking for treasure in someone else's trash. (A dumpster is a large trash container.) It is the trend of foraging for food or valuable items in dumpsters or trash. In many countries, dumpster diving has gone from a taboo to almost part of the mainstream culture, especially amongst travellers!

Freeganism:

Freeganism is a practice and ideology of limited participation in the conventional economy and minimal consumption of resources, particularly through recovering wasted goods like food. The word "freegan" is a portmanteau of "free" and "vegan". While vegans might avoid buying animal products as an act of protest against animal exploitation, freegans—at least in theory—avoid buying anything as an act of protest against the food system in general.



We were doing dumpster diving at 14st, New York City.



We connected the raw data that we collected from prior activities through stickers with different colors, such as yellow for quotes, blue for questions, etc. We grouped them to build this experience map. We analyzed it to discover insights and opportunities.

Insights from the experience map

—Unmet needs and opportunities

How might we reduce the fruit loss created by the conflict between fruit appearance and customer mindset?

Farm will throw many fruit away when their appearance do not fit the market needs. With changing market needs, we see a reduction in this practice because farmers are now able to sell their ugly fruit in the Green Market.

How might we help farmers check the weather consistently?

The weather affects the amount of fruit harvest dramatically, according from farmers' interview. Therefore, the earlier farmers can predict the change of weather, the better they can be prepared to prevent the negative effects.

How might we improve the fruit packaging to reduce damaged fruit?

It is shocking to learn that each supermarket that throw an average of 25 boxes of bananas per day. Meanwhile, Blueberry, strawberry generate waste just through their packaging. The boxes didn't protect the fruit well, and they will speed up fruit rot through contamination.

How might we increase the number of people to donating fruit instead of composting it or throwing it into the landfill?

In retail stores, the workers throw damaged, excess, ugly fruit into trash cans directly. They didn't donate the fruit to food organizations, such as Food Bank, City Harvest, or give the fruit to hunger area. Some stores that had kitchens said that they peel the fruit to make salad and fruit bowls. In the process, however, a significant amount of edible pulp are still thrown away.

These fruits are still edible and they can be repurposed as new products, creating a new business opportunities. We believe, the edible fruit should be used to feed humans, not compost bins.

How might we create more value for farmers by reusing damaged fruit?

Farmers have innovated a delicate system to reduce fruit waste by themselves. For example, by making cider with bruised fruit created by retailers, then selling them directly in the market, they add value to both customers and their business; or composting the rotten fruit to fertilize next year's plantation, they add value to their supply chain.

How might we reduce the fruit loss created by chefs?

In commercial kitchen, chefs didn't utilize fruit fully. Commercial kitchens separated into various stations to prepare food. Because they didn't organize well, many of fruit are surplus due to over preparation. They also have many fruit loss due to time constraint, for example, for efficiency, they only cut the apples to four pieces and throw away other parts with many pulp. This is only one small example about how they generate fruit loss in commercial kitchen.

How might we convince the public that good looking of fruit doesn't equal fresh and delicious?

People don't appreciate the true value of fruit. We throw away old or ugly fruit even it is still edible. Low food prices will make high fruit waste. Consumers often insist on fresh, aesthetically perfect, and abundant fruit. It causes supermarket only choose these kinds of fruit on the shelves.

How might we increase public awareness to treat fruit that on the shelves gently?

We used to think that the reason why fruit is waste a lot in supermarket is that the worker throw damaged, ugly fruit. Now we know that customer picking impolitely also generate lots of waste.





**SELECTING THE RIGHT
LAND TO PLANT**

-OUTREACHING



Food Arts Center is a commercial kitchen with a mission. They're dedicated to helping young adult with physical, developmental or learning disabilities, and any young person disconnected from the support they need to move into a successful and self-sufficient adulthood through their culinary training program.

Target Audience — Young Adult Chefs

—New chefs from Food Arts Center who attend the culinary program

Our target audience is the young adult Chefs from Food art center. This group of people consist of young adults with physical, developmental or learning disabilities, or any young person disconnected from the support they need to move into a successful and self-sufficient adulthood. Food arts center provides them with a culinary program(12 weeks), in order to help them become chefs.

They are the beginners, open and willing to learn, it can be easier to influence their culinary behavior, and become potential zero-waste chefs. After going through the culinary training program in Food Arts Center, most of them want to have their own kitchen someday, which means they can spread their learning to others. That's why we chose them to be our target audience



Link the Chefs and fruit loss

—Connect FAC's Chefs with the fruit loss created by commercial kitchen

In commercial kitchen, we observed that chefs did not have good practices and lack the awareness to reduce fruit waste. So we gave them a lecture about fruit waste issue in New York City. We used data to tell them how many fruit will go to landfill every year. And we showed them the photos we took when we did dumpster diving. They were shocked that we could find so many fresh fruit in trash bag. We also show them pictures that how they cut an apple. "I feel bad about we throw so many food, due to over storage and our habit. What do we do with the peel, core, leaves? We throw them away, because what else we can do?", a young chef said. We talked about one of our fruit experiments--water kefir. When the chefs saw the crystal pink color and taste the sparkling flavor, they wanted to learn how to make that. So we decided to host a workshop one week after. We will teach them how to make water kefir. After that the chefs will make by themselves, and a group of people will come to taste it.



**CULTIVATING WITH
DIFFERENT MEANS**

-PROTOTYPES

The pre-lecture of fruit loss for chefs

—gave chefs lecture of fruit loss in New York city and gained feedback

We hosted a workshop with Young adult Chefs and main Chefs of Food Arts Center. This purposes of the workshop are two, one is to interview young chefs, and knowing more about their thoughts, second is to demonstrate our thesis concept and background, then gain feedback from our audiences. In term of Food Arts Center, the purpose of this workshop is to host a successful workshop and film a great video to advertise their organization's mission—empowering people through food. So, we aligned their valude and goal with us, this is huge precondition for our collaboration.

The process of the workshop:

- Taking food loss pictures from their kitchen;
- Give a 5-10 mins presentation at the beginning, to demonstrate our thesis focus and background, and potential solutions;
- Tell them about Water Kefir, and let them to try some sample;
- While tasting the Water Kefir, we discuss the food waste issues in New York and share our past experiences;
- Showing them the pictures of fruit loss collected from their kitchen, and tell them how might be better.
- Share with them the 50+ resecue fruit recipes about how to re-utilize food loss created by Kitchen;





What is Water Kefir?

—Water Kefir is a probiotic beverage, benefit as yogurt

Background of Water Kefir(tibicos):

The word “Kefir” is thought to have originated from the Turkish word "Keif" which loosely means "good feeling". That sums up nicely the feeling one gets after drinking kefir.

Water kefir is a non dairy version of milk kefir. It is made by fermenting tibicos in a sugar water solution. The sugar in the water provide food for the microflora of bacteria and yeast. The bacteria basically breakdown the sugar and convert it to food for the yeast. In doing so, byproducts beneficial to us are produced such as enzymes, lactic acid and vitamin B complex.

Kefir contains vitamins, minerals and essential amino acids that help the body with healing and maintenance functions and also contains easily digestible complete proteins. The benefits of consuming kefir in the diet are indeed numerous.

Water Kefir Workshop

We hosted a workshop at Food Arts Center and invited young adult chefs and public to come and learn about Water Kefir. Our interviewees said yes about participating our event when we invited them to join, and many people signed up for our events online. At the workshop day, we prepared snack, beverage, fruit, all the pieces of equipment for Water Kefir, and workshop presentation. However, no one showed up due to the weather and the short time of notice. So, our event failed.

But, we did not give up. In order to get audiences involve the event, we moved our event from upstairs to the main hall. We brought the sample on the street to let the passers-by taste. Even we got some people to participate, but It also failed, because only few people wanted to stop and try a weird beverage in a rainy and windy night.



Gained and learned from the failure

—in order to host next successful workshop, we analyzed our failure

The young adult chefs like to cook yummy dishes to serve people. Making water kefir is hard to meet their needs, because it takes time to wait and not fun enough. Which means our solution did not meet our target audience needs yet.

Being interested and showing up are totally different things. The event is free, so that the audiences don't care about showing up or not, even if they said they were interested in it.

The workshop hosted on a raining day and Friday night is a bad decision. Because timing and weather are crucial for participants. Meanwhile, we didn't have enough time to publicize our event online. We post the event on Eventbrite, Instagram and Facebook three days before it happened.

The most important insight is that we should get a focus group who care about environmental issue, especially fruit loss issue, to participate our event. It will be much more easier to get sympathetic response.

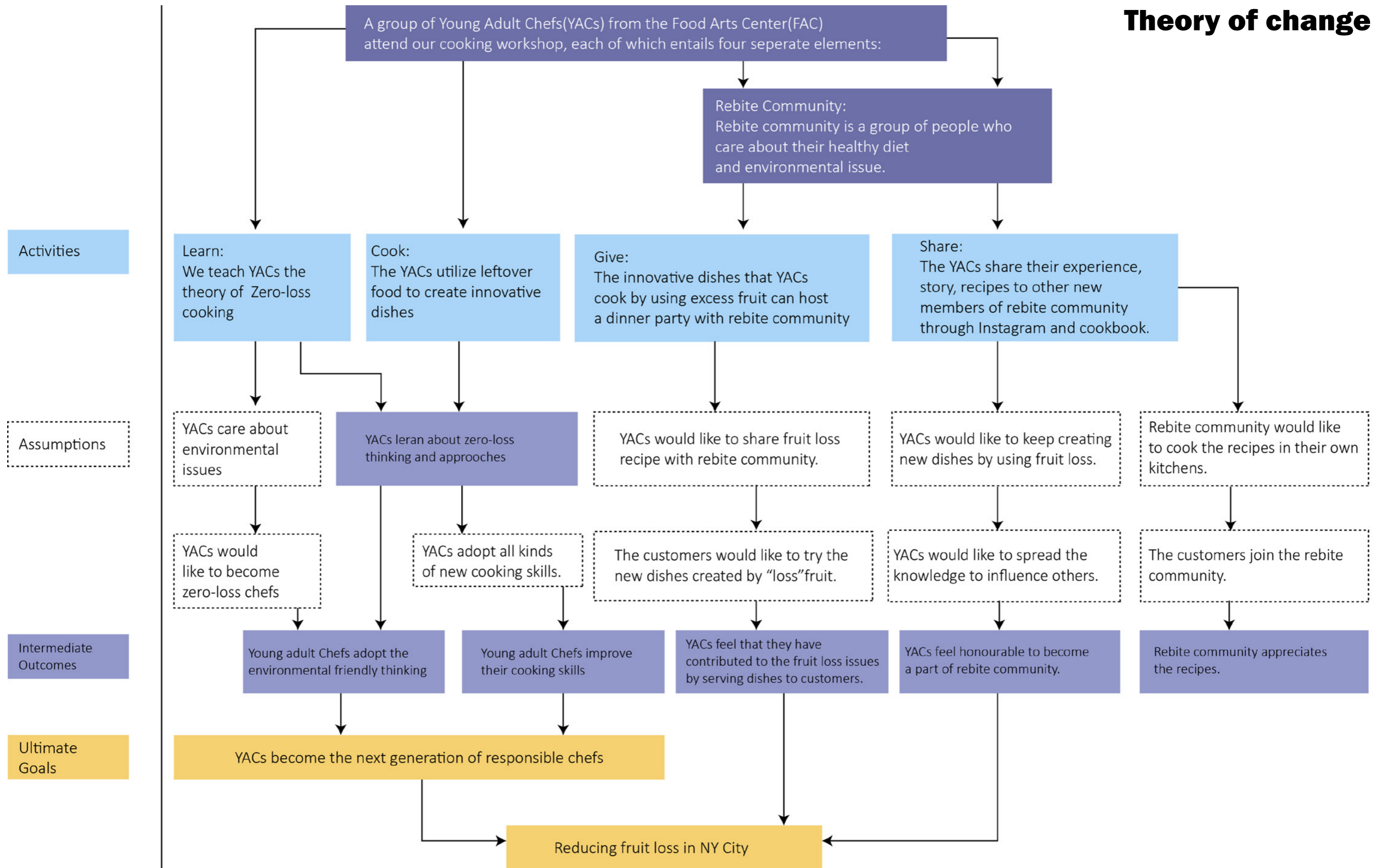


#Rebite

–FINAL INTERVENTION

Rebite is our thesis name. Because we want public to fully utilize their fruit, even the part that they don't normally eat. We searched more than 100 organizations which are working on food waste issue. The most common keywords are six, fresh, resecue, food, re, bite. So, we connect the "re" and "bite" together, "re" stand for sustainable and "bite" stand for innovative dishes, "bite" your exceed fruit again!

Theory of change



#Rebite Workshop

-Create new dish with young adult chefs



Process and purpose of the workshop

—The first step of final intervention

We hosted the workshop with Young Adult Chefs from Food Arts Center. The purpose of the workshop was to create new dishes out of exceed fruit from Commercial Kitchen and serve those dishes to rebite event with rebite community.

Firstly, we collected exceed fruit from commercial kitchen in Food Arts Center. We found many bruised apple, oranges without peel(they used the peel to make the cocktail called Old Fashions for other events), aging watermelon and banana(over storage in their refrigerator). Then we gave them two of our recipes as examples — apple peel and core tea(see at the right page), and water kefir as inspiration. We demonstrated the making process, and cook those recipes with them, a hand-on workshop.

Then we had a discussion around how to reduce fruit waste and came up with our first innovative dish, an orange juicy cupcake. Instead of using milk, we replaced milk to orange juice, which become a dairy-free cupcake. It served with apple source, which also made from exceed apples. It took 2 hours to make a dozen of cupcakes with 4 young adult chefs, and they felt those cupcakes are pure delicious.



Bruised apples from the commercial kitchen



Bruised apples peel and core tea



#Rebite Event

-Share new dishes with eaters



Process and purpose of the workshop

—The second step of final intervention

We hosted the rebite event, invite a group to people to join. We served them with the new dishes that we create with young adult chefs. During the event, we started a conversation around fruit waste issues and how we can do it better. At last, eaters give feedback to chefs, in order to help them iterate more great and innovative rebite dishes.



OUTCOME AND FEEDBACK

6 young adult chefs with social responsibility

14 healthy eaters with rescued fruit recipes

10 pounds of fruit were rescued

5 innovative dishes were created

“This cupcake with apple sauce is so yummy, but if you can make it not only dairy-free, but also gluten-free, that would be perfect!”

—Alex, Educational manager from Hostos Community College

“This tastes so great that I can’t believe we used fruit scraps to make this! My friends and family aren’t going to believe this when I tell them!”

—A young adult chef from Food Arts Center

#rebite sustainable model

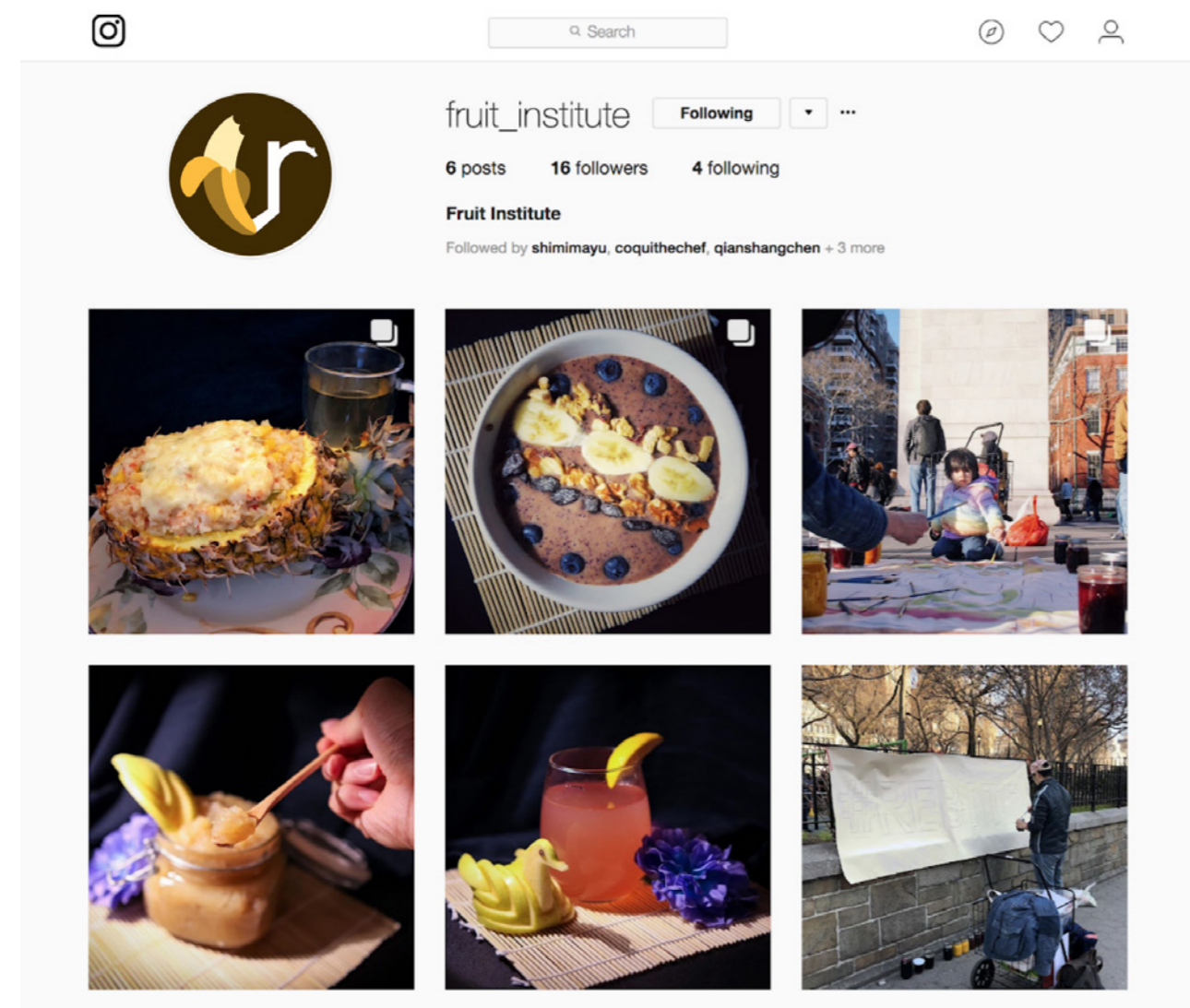
—Online and offline platform to spread the words to the world

Instagram

We created an instagram account called: fruit institute, and a hashtag called “#rebite”. This is an online platform to share our rebite activities and achievements. So the public can follow our work and start to reduce fruit loss at their own kitchen.

Zero loss cooking guidebook

The book contained 3 key types of information: how to host a workshop, what material you need and how to cook. We used cookbook as training materials for the young adult chefs as part of the education system and also as part of how they can affect their friends and family.



Instagram account for Rebite



Apple sauce
Photo by Phoenix Chen



Zero-loss cooking guidebook



Washington Square Activity

—Offline activities to increase awareness and attract public to follow us

We shared our recipes, workshop, and activities online to attract public attention. But it is hard to get followers at the beginning, so we created a public activity in order to let more people to know us.

The public activity is for increasing human awareness. Our thesis is not an isolated students project anymore, it is a social project.

We made food color pigment advance. We collected food waste and unused food from greenmarket, retail stores and supermarkets, such as purple onion peel, yellow onion peel, green vegetable, carrot, orange peel, pineapple peel, apple, and beet. We extracted the color from them by two ways, one is to use water to boil them for 45-60 mins, like onion peel, red cabbage; and the second method is to smash them with blender. Then we used the strainer to filter out residue and remain the pure food color. We put the residue into compost.

After that, we went to Union Square to paint our artifact. The reason why we chose the market was that the customers who shop in greenmarket is the group of people who care about their health and environmental issues. However, the plan didn't go well, we got zero participants there.

Then we listened to our friends' suggestion and went to Washington Square. Many people asked what we were doing, who we are and they gained more interest after they heard how we extract the color from waste food to do this activity. After they joined us to paint, they also started to follow our instagram account "fruit_institute" and hashtag "#rebite". This is the start point of rebite community.

We were doing painting under the sunset at Washington Square. Many public joined our activity, and interest about what we are doing.



We create the our "#rebite" flag out of food color pigment, and this is the start point for rebite community.



Rebite Zero-loss Guidebook

—Offline guide book to let other culinary organization or individual to learn how to become zero-loss chefs

We collected the creative recipes that we created with young adult chefs to make this cooking guidebook. All the recipes have already tasted by the Rebite community. This book is part of our educational system. New cohorts of young adult chefs can use this book as a reference. Based on the recipes, they can create new dishes by themselves, and keep testing them with Rebite community. Once they create enough new delicious dishes, the new generational chefs can make a new version of the guidebook. Undoubtedly, any people can use this guidebook to cook in their own kitchens to rescue fruit. Meanwhile, if other chefs want to take the first step to become a zero-loss chef, the guidebook can be their perfect choice.





Apple Peel and Core Tea

INGREDIENTS

- 6 apple peels/apple cores
- 3-4 C water
- 1/2 tsp cinnamon (or 1 cinnamon stick)
- 1 Tbs honey
- 1 Tbs lemon juice



Photo by Phoenix Chen

Directions

1. Place apple peels in a sauce pan. Cover with water and lemon juice and cinnamon.
 2. Bring to a boil for 10-15 minutes, until liquid is colorful and appley.
 3. Strain out the apple peels using a colander positioned over a large bowl, then, add in the honey.
- Taste... add additional honey or cinnamon to taste



APPENDIX
-OTHER MATERIALS

Water Kefir

- 1. What do you think of this product?
1 2 3 4 5
- 2. How is the sweetness of this product?
1 2 3 4 5
- 3. How is the smell of the product?
1 2 3 4 5
- 4. Would you like to buy it?
1 2 3 4 5
- 5. Will you recommend it to your friends?
1 2 3 4 5

Fruit Tea

- 1. What do you think of this product?
1 2 3 4 5
- 2. How is the sweetness of this product?
1 2 3 4 5
- 3. How is the smell of the product?
1 2 3 4 5
- 4. Would you like to buy it?
1 2 3 4 5
- 5. Will you recommend it to your friends?
1 2 3 4 5

Orange cupcake with Apple Sauce

- 1. What do you think of this product?
1 2 3 4 5
- 2. How is the sweetness of this product?
1 2 3 4 5
- 3. How is the smell of the product?
1 2 3 4 5
- 4. Would you like to buy it?
1 2 3 4 5
- 5. Will you recommend it to your friends?
1 2 3 4 5

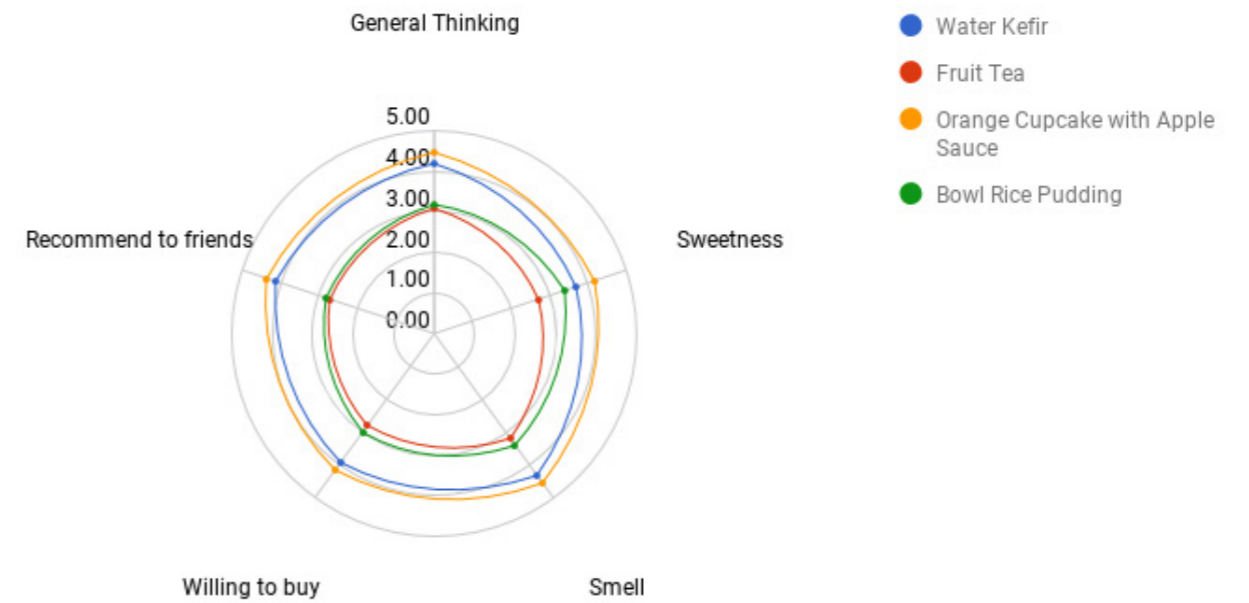
Bowl Rice Pudding

- 1. What do you think of this product?
1 2 3 4 5
- 2. How is the sweetness of this product?
1 2 3 4 5
- 3. How is the smell of the product?
1 2 3 4 5
- 4. Would you like to buy it?
1 2 3 4 5
- 5. Will you recommend it to your friends?
1 2 3 4 5

Do you have any other recommended recipes?

Please evaluate the dishes:
1 is the worst, 5 is the best.

The testing event survey result



The authors of this book, Zongliang Shang(left), and Qianshang Chen(right).





Qianshang Chen (Phoenix)

—Industrial and UX designer

My name is Qianshang Chen and you can call me Phoenix. My passion for design brings me all the way from China to pursue MFA Design for Social Innovation at the School of Visual Arts, NY. I am interested in creating simple and viable products that solve real users' needs. Before coming here, I was a product designer at New plan design company, one of China's most popular design agency and give me the strength to become a quality designer. For the past three years, my work focussed creative thinking, design scope, research and clients' communication. I studied in DSI to learn how to tackle social issues. So far, I have engaged many social impact topic, such as smoking-free regulation, human justice, youth crime, agriculture development, and so on.



Zongliang Shang

—Graphic, visual designer

Zongliang is a graphic, visual designer with a background in visual communication and fine arts. Now he is learning design for social innovation that provides the ability to connect systematic thinking and design. As a designer, he believes that design is the application of thinking methodologies to solutions for complex human problems.

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Rebite participants
and young adult chefs