

# Sharing for the Benefit of All

-- Sustainability in the Food Bank Supply Chain

Qiubai Ye<sup>1</sup>, Jiaming Zhang<sup>2</sup>, Siqu Zhou<sup>2</sup>, Leyi Yang<sup>3</sup>, Tongyu Wu<sup>4</sup>

<sup>1</sup> Suzhou Foreign Language School, 215011, China

<sup>2</sup> Nanjing Foreign Language School, 210008, China

<sup>3</sup> Changwai Bilingual School, 213000, China

<sup>4</sup> Nanjing Foreign Language School Xianlin Campus, 210000, China

---

**Abstract:** From 2020 to the present, about 30 billion yuan of expired food is wasted in China every year. Against this background, this study proposes a two-pronged parallel food bank supply chain innovation program aimed at solving the problem of expired food waste. Offline, we work with merchants to collect and distribute expired food to the public free of charge, and online, we continuously update social media to popularize expired food and develop a small program that allows the public to communicate directly with merchants and make appointments to collect expired food. The project measured the impact of the program and the satisfaction of the public through questionnaires and interviews with the audience. Through the program, 93% of the sample surveyed changed their attitude towards expired food from negative to positive; 82% gained more knowledge about expired food; and 92% were very satisfied with the program. According to social media statistics, over 10,000 media views were recorded during the program, achieving a more successful online popularization effect. In the future, our project will continue to distribute and establish cooperation with more merchants, in order to protect the environment and sustainable development of the road steadily and far.

**Keywords:** Food Waste, Near-expired Food, Sustainability, Supply Chain Innovation.

---

## 1. Introduction

Data shows that 931 million tons of food is wasted every year, which is 17% of the global food. Among them, 3 million tons are foods that has reached its expiration date, which not only pollutes the environment, but also affects the economy. At the same time, there are still deficiencies in the relevant policies, public awareness and existing programs regarding the problem of expired food waste, which are reflected in the following aspects:

First of all, from the aspect of laws and regulations, for food that has reached its expiration date, the Food Safety Law of the People's Republic of China has not formulated corresponding food safety national standards or administrative regulations, and has not built an effective expired food safety traceability system, which is not conducive to the supervision of the sources of expired food as well as the circulation, sale and storage of expired food [1].

In addition to this, consumer awareness of expired food is not optimistic. The study by Zhang Lengzhu et al. [2] showed that 56.63% of respondents chose not to buy expired food, and the proportion of respondents who were not willing to buy expired food was heavier. This not only reflects that China's consumer recognition and acceptance of expired food is still far from enough, but also means that the expired food market still has huge potential and development space, and also shows that the popularization of expired food publicity work is a long way to go.

In the past, people have made a lot of attempts to solve the problem of food waste, and they have all adopted the way of selling almost-expired food at lower prices to avoid food waste. However, due to the lack of a stable supply of goods and the general lack of public understanding of expired food, expired food in supermarkets is often silted up, resulting in the problem of expired food has not been well solved. It

affects both store revenue and, by association, economic development.

The purpose of this practice is to rationalize the distribution of expired food to the people in order to prevent excessive wastage of food, and to provide assistance to the people so that they will be willing to accept expired food by understanding that expired food is not harmful to their health.

## 2. Essential Research

### 2.1. Food at the End of its Shelf Life and "Food Banks"

The so-called expiration date food, also known as critical food, refers to the food that is close to the shelf life but has not yet expired, and is within the safe range of edible. There are two characteristics of adventitious food: firstly, it is a food that is close to the shelf life from the time dimension; secondly, it must be edible from the attributes of the food.

The term "food bank" refers to a non-profit private charitable organization that is formed to reduce waste by collecting excess food from the community and transferring it to those in need[3]. The sources of food for food banks are mostly individual donations and corporate donations, such as personal surplus food, food that cannot be easily sold in supermarkets or food factories.

#### 2.1.1. Waste of Foods Reaching the Expiration Date

Globally, 931 million tons of food are wasted every year, accounting for 17% of the world's food [4].

Economically, food loss and waste costs the global economy \$936 billion annually, and food loss and waste causes China an equivalent economic loss of up to \$1.88 trillion annually[5]. In addition, according to the report of AiMedia Consulting [6], the total value of China's snack food industry in 2020 exceeds 3 trillion yuan, and even if the

calculation is based on 1% inventory deposition, the market size of the almost-expired food industry is about 3 billion yuan.

To summarize, the global food waste problem is particularly serious, and expiration date food, as a part of it, also occupies a large proportion.

### 2.1.2. Relevant Policies and Regulations on Prolonged Food Waste

In Europe and the United States, countries have introduced bills against the waste of expired food since 2016 [7]. In Japan and South Korea, there are also regulatory restrictions for the definition of expired food, which helps the re-trafficking of expired food.

In China, the Anti-Food Waste Law of the People's Republic of China, which was introduced in 2021, has reduced expired food waste to a certain extent by putting forward more economical, reasonable, and operationally high requirements for food that would have been destroyed and disposed of by companies as expired food in accordance with previous requirements under the Food Safety Law. However, although China's regulations and policies on end-of-life food have been carried out, they started late and are still imperfect.

## 2.2. Existing Programs

Currently, domestic and international programs for the recovery and redistribution of expired food are mainly based on campus distribution and social distribution. The program is mainly based on two ways: campus distribution and social distribution.

### 2.2.1. Campus Distribution

Campus distribution programs work with school cafeterias to recover surplus food for redistribution to students in need, such as the UBC program [8], or to low-income groups in the surrounding community, such as the Campus Kitchen program [9]. The advantage of this type of program is the ability to communicate directly with people from all parts of the program through interviews and questionnaires, making it easier to recover feedback. However, the disadvantages are also more obvious, which are reflected in the high dependence on various types of personnel in the school scenarios, limited application scenarios and lack of universality.

### 2.2.2. Social Distribution

Social distribution programs can also be collectively called "food bank" programs, whereby expired food is obtained through cooperation with merchants and distributed to community residents by intermediary forces (volunteers, "shared refrigerators", or online websites)[10]. The advantages of this program are that it expands the impact of the program and reaches more people. However, there are also drawbacks; current food banks generally lack a popular science component and require a large number of volunteers to collaborate to complete, making it difficult to develop a replicable model.

### 2.2.3. Program Optimization and Highlights

The program is carried out through a two-pronged parallel approach, and takes the measures of online media publicity, popularization of general knowledge of almost-expired food, and offline activities to expand the scope of recycling. At the same time, through the dynamic calculation model and the establishment of a feedback mechanism, the program strives to meet the needs of users as well as to maintain the program's continuous development and stimulate its potential.

## 2.3. Basic Overview of People's Awareness of Almost-expired food Across the Country

This project used a questionnaire survey to understand people's awareness of expired food across the country. The questionnaire is divided into three parts, the first part is the respondents and their basic profile, the second part is the respondents' awareness and knowledge of expired food, and the third part is some suggestions from the respondents for distribution. The project questionnaire was distributed through Questionnaire Star, and disseminated to people through WeChat, Jieyin, Xiaohongshu and other platforms, and a total of 500 valid questionnaires were collected. The relevant question options are analyzed below to understand the respondent group's awareness of expired food and their suggestions for distribution, and to analyze the factors affecting individuals' awareness of them, so as to provide a decision-making basis for the subsequent innovative action plan.

### 2.3.1. General Profile of Respondents

The respondents were mainly young people. In terms of gender of the respondents, 52.2% were male and 47.8% were female; in terms of age of the respondents, adolescents accounted for 2.6%, youths accounted for 54.6%, middle-aged accounted for 32.8%, and elderly accounted for 10%. The occupation of the respondents is mainly service workers, students accounted for 5.2%, civil servants accounted for 6.8%, professionals and technicians accounted for 8.6%, employees accounted for 7.6%, businessmen accounted for 9.6%, service workers accounted for 18.2%, industrialists accounted for 9%, farmers accounted for 14.2%, private entrepreneurs accounted for 10.8%, and retired people accounted for 10%.

### 2.3.2. Insufficient Knowledge of the Public about Almost-expired Foods

From the statistical data of the respondents, there is a relative lack of knowledge related to expired food and a lack of knowledge about the edible nature of expired food. The survey shows that 71.8% of the respondents have a clear understanding of the definition of expired food, while the rest of the respondents have a relatively lack of knowledge in this area.

However, 68.6% of the respondents were not aware that expired food could still be safely consumed and most of them did not know about its safety. And 70.92% did not know how to judge whether expired food is edible or not, and most people did not understand the criteria for judging its edibility.

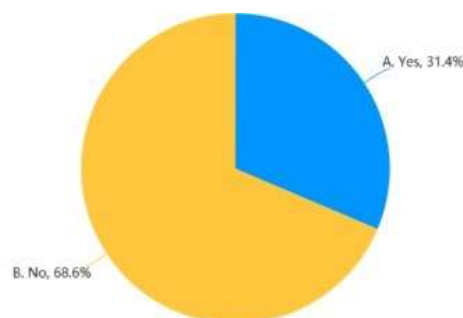
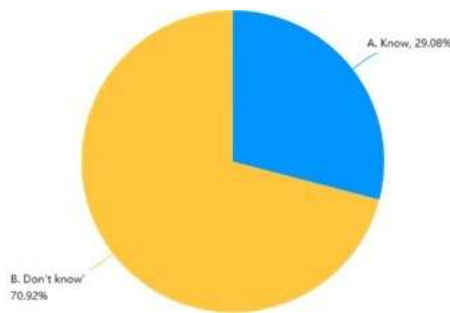


Figure 1. Aware that expired food is still edible (the left one)



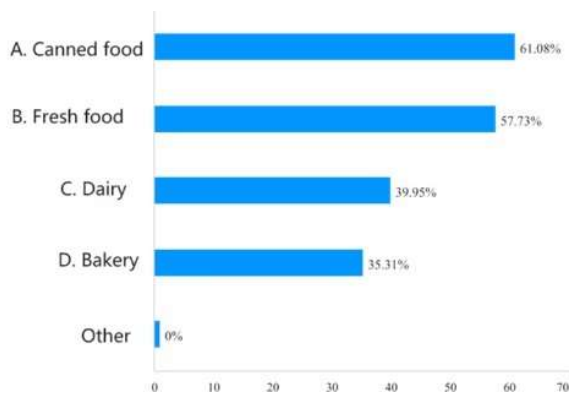
**Figure 2.** Degree of knowledge in determining the edibility of expired foods (the right one)

### 2.3.3. Public Acceptance of Expired Food is High

Through the survey, 18.8% of the respondents are accepting of almost-expired food very well, 58.8% are generally accepting of it, and the remaining 22.4% cannot accept almost-expired food. Overall, most of the respondents can accept almost-expired foods.

### 2.3.4. Diversified Needs of the Public for the Distribution of Expired Foods

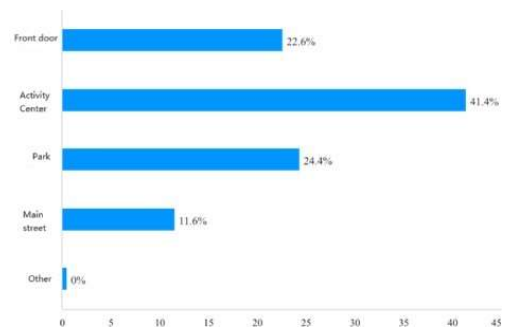
Through the statistical data of the respondents, people have diversified and personalized demands for the distribution of expired food in terms of food types and distribution locations. The survey shows that 61.08% of the interviewees want the food distributed to be canned food, 57.73% want it to be fresh food, 39.95% want it to be dairy products, and 35.31% want it to be bakery food. People basically have a certain demand for all kinds of food.



**Figure 3.** Preference for types of adventitious foods

In addition, 88.4% of the respondents hoped that expired food should be labeled with the expiration date and conditions of preservation for each type of food when it was distributed, while the rest did not think so. Overall, it seems that people prefer to consume foods with expiry dates on the basis that food safety is guaranteed.

Meanwhile, 22.6% of the respondents wanted the distribution to be done at the gates of their neighborhoods, 41.4% wanted it to be done at activity centers, 24.4% wanted it to be at parks, and 11.6% wanted it to be next to main roads. Thus, there is a preference for food distribution to take place in high-traffic, more formal locations.



**Figure 4.** Expectations of the location of temporary food distribution

### 2.3.5. Conclusion and Inspiration of the First Questionnaire Survey

First, the public's awareness of almost-expired food is generally insufficient, and this project will strengthen the publicity and popularization of science. Secondly, the public still has a certain degree of acceptance of the distribution of expired food, and has different needs for the types of expired food distributed. In follow-up activities, the project will set up distribution sites in high-traffic, more formal locations, thus increasing the volume of distribution while increasing the impact of the project.

## 3. Innovation Design

### 3.1. Program Expectation

1) Through online social media publicity and offline free distribution of expired food, let more people know about expired food, increase the acceptance of temporary food, so as to reduce the waste of expired food due to the lack of awareness of expired food, which may lead to the rejection of expired food by consumers.

2) Reduce the waste of expired food at the level of merchants by cooperating with them to collect expired food.

3) Through the establishment of an online app, the public can directly communicate with merchants and make appointments to collect expired food, forming a truly sustainable supply chain.

### 3.2. Audience

This project is intended for all people in China. In the first phase, the target audience is the community of Xianlinyuan in Hangzhou and the pedestrians in Suzhou Center.

### 3.3. Practical Program Design

One of the major innovations of this project is the innovation of the "food bank" supply chain, so the practical program of this project follows the supply chain route, which is reflected in the following two aspects, as shown in Figure 5.

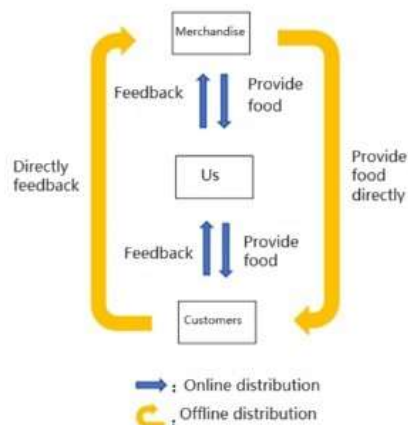


Figure 5. Food Bank Supply Chain Route Map

### 3.3.1. Offline route

First, recycling from merchants. The project collects expired food from food manufacturers.

Second, offline distribution. This project distributes the expired food recovered from food manufacturers to the public offline.

### 3.3.2. Online Line

First, social media popularization. The project popularized the basics of expired food on several social media platforms.

Second, small program establishment. The project will develop a small program in which the public can give feedback to merchants, and merchants can present daily available food in the small program.

Feedback, and the merchants can propose the categories of expired food available for daily pickup and the location of pickup in the applet.

### 3.3.3. Methods Guidance

To ensure that this project was conducted professionally, efficiently, and comprehensively, interviews were also conducted with food experts as well as staff from food safety regulatory agencies prior to the actual implementation of the program. The food experts provided the basic professional knowledge of adventitious food for this program during the interviews, including the definition of adventitious food, national policies, and safety judgment standards.

The interviews with food experts provided basic expertise for this project, including the definition of end-of-life food, national policies, criteria for determining safety, and scientific methods for measuring food safety. The staff of the working group of the regulatory department provided this project with suggestions on the regulation and support of expiration date food in terms of national policies, consumer acceptance of expiration date food, and practical implementation of the project.

### 3.3.4. Feedback

The project measured the effectiveness of project implementation through questionnaires and interviews. The feedback questionnaires included respondents' views on expired food before the free distribution of expired food activities; respondents' attitudes, feelings and gains after participating in the free distribution of public welfare activities; and the extent to which respondents believed that the free distribution of public welfare activities contributed to the society.

The purpose of the feedback interview is to understand the respondents' attitudes, feelings and gains after participating in the free distribution program. The purpose of the feedback

interviews is to understand the respondents' attitudes towards expired food before and after participating in the program; and to understand the respondents' attitudes, feelings and gains from the program.

## 4. Analysis of Results

### 4.1. Project Progress

#### 4.1.1. Cooperation with Merchants

Ten convenience stores were contacted offline, but they refused to cooperate because they have specialized manufacturers to recall expired food. In the end, after contacting 6 food manufacturers online, we reached a cooperation with Wangshengda and Good Bargain, which provided 300 expired food products for free for this project.

#### 4.1.2. Cooperation with Distribution Sites

The project team members had acquaintances who worked in the Xianlin community in Hangzhou, so cooperation with the community and the farmers' market near the community was successfully reached. The manager of the Good Bargain, who was contacted online, works at the Suzhou Center Good Bargain. By contacting the Suzhou Center Group and getting approval for the event venue, the Suzhou Center Metro entrance was successfully established as the third distribution point.

#### 4.1.3. Offline Activity Coverage

The project culminated in three campaigns, in Hangzhou Xianlinyuan community, Hangzhou Xianlinyuan Farmers' Market and Suzhou Center. Covering two cities and affecting about 5,000 people.

#### 4.1.4. Applet Development and Design

Since the development and launch of WeChat applets takes a long time, this project used the "Inkblade" software to design the preview image of the applet. The home page of the app contains links for food collection, user collection list, and user feedback and suggestions.

The user clicks on "Food Pickup" to jump to the food pickup interface, which presents the types of food available for pickup, the pickup location, and the remaining quantity. The food provided in this section will be capped by the future Loyalty Merchants directly through the background of the app.

Users can click "My Collection" to jump to the collection list interface, presenting the types of food, location, time and quantity of food that has been collected.

Users can also directly enter their suggestions on food and merchants in the "Feedback and Suggestions" column on the home page, and all feedback and suggestions will be directly presented to the merchants.

Through the applet, users can more conveniently book online to collect expired food for free, and merchants can also directly update and upload expired food available for collection daily. In addition, the user feedback mechanism of the app establishes a direct communication channel between users and merchants.

### 4.2. Results of the Online Campaign

Xiaohongshu platform gained 1,400 fans, and Jieyin platform gained more than 10,000 views, obtaining more successful online publicity results.

### 4.3. Analysis of Offline Survey Results

#### 4.3.1. Basic Situation of the Sample

Through offline questionnaire distribution, 309

questionnaires were effectively collected.

**4.3.2. Public Attitudes Toward Almost-expired Food Turn Favorable**

The data showed that originally 48.22% of the survey respondents held negative and no opinion towards expired food. However, as a result of the campaign, 93.53% of them have changed from their original attitude to a positive one.

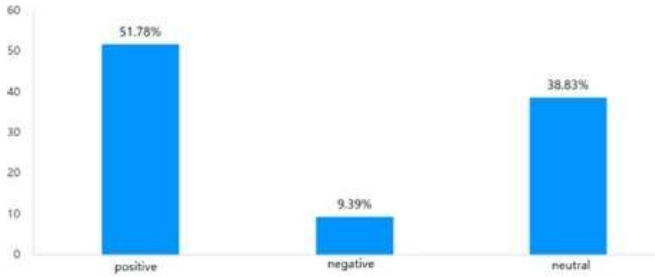


Figure 6. Attitudes towards almost-expired food

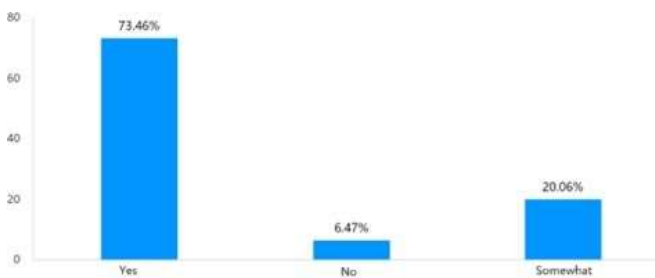


Figure 7. Attitudes towards almost-expired food after campaign

**4.3.3. Increased Public Awareness of Almost-expired Foods**

The data showed that 82.85% of the survey respondents gained more knowledge about expired food through this activity. It can be seen that this activity has achieved a high scientific significance.

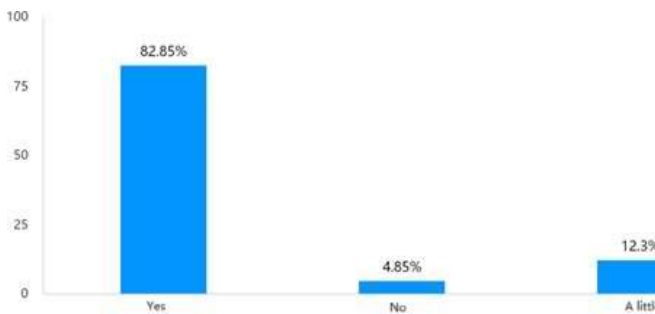


Figure 8. Gaining knowledge on adventitious foods

**4.3.4. Satisfaction of the General Public**

The data shows that 92.88% of the respondents were "satisfied" and "very satisfied" with the event. It can be seen that this activity has achieved a very high level of recognition from the public.

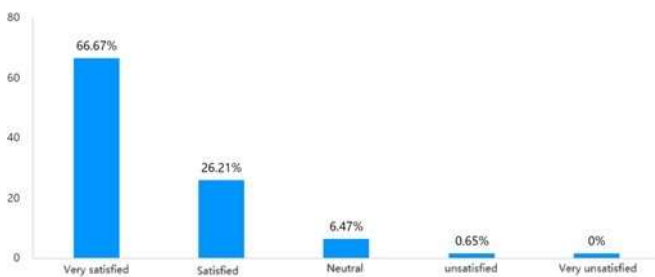


Figure 9. Level of satisfaction with activities

**4.4. Analysis of Offline Interview Results**

**4.4.1. Basic Information of Interviews**

This study conducted interviews with 20 activity beneficiaries aged 18-75 years old. This study focuses on the three main dimensions: the interviewee's knowledge of the dying food, the interviewee's acceptance of the dying food, and the interviewee's attitude towards the activities of this study.

**4.4.2. Interviewees' Knowledge of Almost-Expired Foods**

There were 15 codes related to respondents' knowledge of expired food. There were 7 codes based on the channel of knowledge. Supermarkets are the channel through which most of the interviewees learn about expired food. There were 8 codes based on the perception of safety criteria of expired food, and half of the respondents believed that expired food is not safe. In addition, most of the respondents had shallow perceptions of safety judging criteria for expired food, such as "food package (whether) broken" and "food package surface (whether) clean".

**4.4.3. Respondents' Acceptance of Almost-expired Foods**

There were 20 codes related to respondents' acceptance of expired food, of which, while most were supportive, some were hesitant or even strongly opposed. Respondents with a supportive attitude are mostly based on the concept of thrift and saving money, while those with an opposing attitude tend to have a higher economic base and pay more attention to food quality and safety. For example, "I have a good financial foundation and my first consideration is (food) quality, so I do not accept (expired food)".

**4.4.4. Respondents' Attitudes Towards this Research Activity**

There were 17 codes related to respondents' attitudes towards this research activity. All respondents expressed satisfaction and recognition of this activity, especially praising the social contribution of this project as well as the knowledge of science. For example, "This kind of public welfare activity contributes a lot to the society, and I am very satisfied to participate in the public welfare activity of distributing expired food for free," and "I know how to store different expired food through this activity."

**5. Discussion and Conclusion**

**5.1. Conclusion**

Deepening the public's awareness of expired food For the problem of expired food waste that the team wants to improve, the project, on the one hand, publishes tweets and videos to popularize the knowledge of expired food on social media, and on the other hand, cooperates with food merchants and distributes the recycled expired food offline, and examines the project's effect through questionnaire surveys and offline interviews. Statistics from online platforms show that the team has gained more than 1,400 fans in Xiaohongshu and more than 10,000 views in Jieyin. The number of views shows that the online knowledge popularization of this project has played a certain effect. The team also completed two offline activities in Hangzhou Xianlin Community and Suzhou Center, and the questionnaire data and interviews show that after the offline distribution activities, the participants with positive attitudes towards expired food increased from 48% to 93%, and another 92.88% of participants expressed satisfaction with the activities, indicating that the activities of this project expressed satisfaction, indicating that the

activities of this project received very high recognition from the public. This shows that the activities of this project have improved the acceptance of expired food by the public and reduced the problem of wastage of expired food to a certain extent, which is in line with the original intention of this project. This is in line with the original purpose of the project.

## 5.2. Discussion

### 5.2.1. Shortages

Overall, there are still some shortcomings in this project:

1) Due to the actual situation of the group, the scope of our food distribution received spatial limitations, so far the activity was only carried out in Suzhou and Hangzhou, which did not target the whole population as expected;

2) Although the tweets on the online platform received a lot of views (10,000+), this figure is still small compared to the total population of China, and cannot change the awareness of the entire population about expired food.

food awareness situation of the whole population;

3) The sample size of the questionnaire survey is small, and there is a lack of detailed statistics for specific groups of people or different categories of people, so the data analysis is not comprehensive and specific enough.

The sample size of the questionnaire survey is small, and there is a lack of detailed statistics for specific groups or different categories of people, so the data analysis is not comprehensive enough.

### 5.2.2. Expectation

With regard to the above problems, the project team will continue to make efforts. On the one hand, the project will continue to use social media platforms to publicize the scientific knowledge of expired food and the scene of the project's expired food distribution activities in the form of tweets or videos; on the other hand, the project will continue to promote the offline distribution project as far as it is able to do so, to maintain the continuous supply of the existing distribution sites, and also try to promote the project to more

regions across the country, so as to expand the project's influence and achieve the project's goal. Achieve the goals of this project.

## References

- [1] WWF. (2018). Report on Food Waste in Urban Catering in China. Geoscience and Resources Research, Chinese Academy of Sciences.
- [2] Zhang Lengzhu, Miao Yunhui Fu Tingting. (2021). Analysis of consumers' perception and choice behavior of expired food.
- [3] He, Yueying. (2009). Exploring the construction and market-oriented operation mode of Chinese-style food banks. Business Culture (Academic Edition) (2009). Contemporary Economy(11),73-77+119.
- [4] FOOD SECURITY.(2021). The world's food waste problem is bigger than we thought - here's what we can do about it.Food Economic Forum.
- [5] Wang Jiaqi. (2023). China Food and Nutrition Development Report 2023. China Food and Nutrition Innovation and Development Forum.
- [6] AiMedia.com. (2022). 2021-2022 China's Advent Food Industry Development and Benchmarking Case Study Report.Report.<https://www.imedia.cn/c400/83833.html>.
- [7] Xiao, Pinghui. (2016). U.S. Food Date Labeling Legislation and Implications for China. China Food and Nutrition (12),10-14.
- [8] Amalee Truong, Lauren Ebert, Crystal Yu, Kaori Yoshii, & Bryna Turk.(2021). Promoting Campus Food Security through Food Recovery-An Evaluation of the UBC Food Recovery Pilot Program. University of British Columbia.
- [9] Holland, Victoria.(2018). Effectiveness of Student Led Hunger Relief Project Towards Food Waste Recovery and Nutritional Impact in Low Income Communities.Health Sciences Student Work. 5.
- [10] Gu Yiliang, Bai Yang, Xi Dongqi. (2023). Food Bank: Deposit Love, Take Out Warmth. Public Opinion Weekly.