

Policy Brief

Key Messages

- In China, the largest amount of FLW occurs at postharvest handling and storage stage. Fruits and vegetables take up the highest share of total FLW.
- The progress in technology and infrastructure has contributed a lot to reducing food loss in China.
- The new legislation has encouraged immediate actions by governmental departments, industry groups, and media.
- A holistic and scientific measurement of FLW covering all stages of food supply chains and all food categories is essential for benchmarking and monitoring as well as offering evidence to define specific standards for FLW legislation.

Food Loss and Waste in China: Status Quo, Policies and Actions

By Dr. Jiaqi Huang

Introduction

In recent years, food loss and waste (FLW) has been a global problem and it has drawn increasing public, academic, and political attention. The reduction of FLW by 50% until 2030 became one of the UN's Sustainable Development Goals in 2015. In China, FLW annually accounts for 27% of food which is produced for human consumption. Regarding the world's total FLW, China is responsible for about a quarter. Therefore, it has a big role to play in reducing global FLW.

Already since 2014, FLW reduction has received high-profile attention in China. It has been included in national agenda setting and policy formulation and China has implemented a series of suitable actions. In April 2021, the Anti-Food Waste Law was passed.

This policy brief reviews the status quo of China's FLW. Segmentation and scarcity of evidence regarding certain food supply chain stages and food categories are identified. Furthermore, policies and actions to reduce FLW and their effects are reviewed and recommendations for further FLW reduction in China are made.

Status quo of FLW in China

Recent scientific research has provided the latest estimate of FLW along China's food supply chain. It was based on large-scale fieldwork conducted over six years plus a comprehensive literature review. The estimation shows that from 2014 to 2018, every year, 349±4 Mt (27%) food produced for human consumption was lost or wasted in China (Xue et al., 2021). Some earlier studies indicated similar estimates, within a range of 20 to 40% (Liu, 2014; Liu et al., 2013a). While the share of 27% is still lower than in developed countries like the US (30 to 40%), the total quantity of FLW in China is about a quarter of the world's total FLW (1,300 Mt).

Concerning the FLW along different stages of the food supply chain, the largest amount of FLW in China is found at the postharvest handling and storage stage both for the total (159±3 Mt, 45%) and for most individual food categories (28%, 54%, 50%, and 56%, respectively, for cereals, roots and tubers, fruits and vegetables, and meat) (Xue et al., 2021). In contrast, in many developed countries FLW at postharvest handling and storage stage is rather low (Table 1). The high FLW at postharvest handling and storage stage in China results mainly from low technological and infrastructural capacity (Liu, 2014). The production stage also contributes to a notable share (24%, 82±2 Mt) of total FLW, particularly for cereals (23%) and milk (47%). This is mainly caused by extreme weather, insects, diseases, and poor harvest technique (FAO, 2019). Food waste generated at consumption stage is also alarming, contributing to 17% of the total FLW (59±1 Mt). Dining out is increasing in China, and it is estimated that there are 17 to 18 Mt food being wasted annually in catering services in Chinese cities (WWF, 2018). It is noteworthy that out-of-home food waste accounts for 13% of the total FLW, far exceeding household food waste (4%). On the contrary, many industrialized countries have a higher FLW share from household food waste. FLW that is generated at the stages of distribution and retailing and processing accounts for 11% and 4% of total FLW in China, respectively.

Countries	Production	Postharvest handling, storage	Processing	Distribution, retailing	Consumption
China	24%	45%	3%	11%	17%
Japan	10%	10%	44%	4%	32%
EU	25%	0%	24%	5%	46%
UK	20%	5%	16%	7%	53%
Canada	9%	0%	18%	14%	59%
Finland	12%	0%	20%	18%	50%

Table 1: Comparison of FLW by stages of food supply chain (Source: Xue et al., 2021)

Within food categories, fruits and vegetables account for the highest share (62%, 215±4 Mt) of total FLW in China, followed by meat (17%), cereals (9%), and oilseeds and pulses (5%). Fruits and vegetables also dominate (over 30%) at each stage of the supply chain, especially in retail. However, when looking at the FLW rate (proportion of FLW to the production amount of a specific food category), meat is No. 1 (50%), followed by oilseeds and pulses (49%), roots and tubers (32%), fruits and vegetables (28%), fish and seafood (23%), cereals (13%), and milk (8%) (Figure 2). A more recent survey conducted between 2017 and 2019 in 12 provinces across China shows that the loss rate of vegetables and fruits from production to distribution is surprisingly lower than in industrialized countries (Lu et al., 2021).

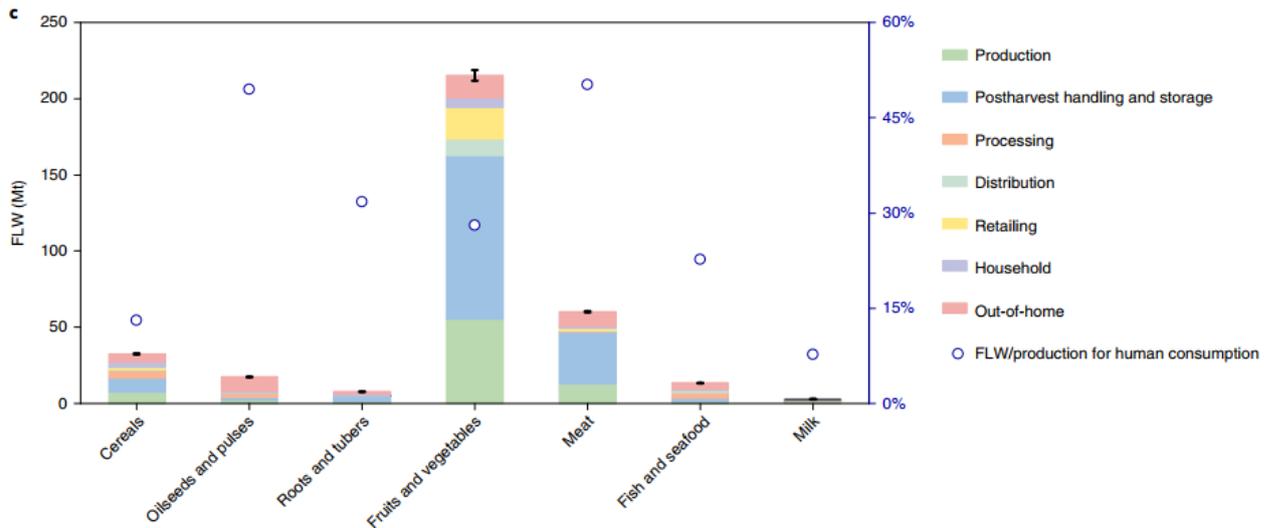


Figure 2: Estimated FLW in China by food categories, annual average 2014-2018 (Source: Xue et al., 2021)

Chinese policies, laws and regulations as well as campaigns addressing FLW

From 2007 to 2014, China has established some regulations, policies, and official plans addressing FLW (see a summary in Liu, 2014). However, many of them mainly aim at improving the efficiency of the agricultural sector, or cover waste or municipal solid waste in general, but not specifically adapted to FLW. Moreover, quite a few of them focus on postharvest losses (especially at storage), but only very few on consumer food waste.

First, since 2014, FLW reduction has received greater attention on top level in China which has resulted in several policies and actions. Most importantly, new legislation was adopted: The Anti-Food Waste Law of the People's Republic of China came into force on April 29, 2021. Its overall aim is to prevent food waste, guarantee food security, carry forward traditional virtues of the Chinese nation, and promote sustainable economic and social development. The 32 articles of the law mainly regulate the responsibilities of catering service providers, catering takeaway platforms, tour operators, supermarkets and shopping malls, education administrative authorities and news media. Key points include: catering service providers have to take measures to prevent food waste, catering takeaway platforms have to remind consumers to order an appropriate amount of food in a conspicuous way, tour operators have to guide tourists to eat in a civilized and healthy manner, supermarkets and shopping malls have to strengthen the daily inspection of the food they operate and carry out categorized management of the food near its shelf life. Education administrative authorities and news media have to guide the public to establish a correct concept of food consumption. It is prohibited to produce, release or disseminate any program, audio or video information that advocates food waste, such as eating large quantities and overeating. Vendors that "induce or mislead consumers into making excessive orders" can now be fined up to ¥10,000 (€1,390). Restaurants that consistently waste "large amounts" of food face fines of up to ¥50,000 (€6,952). Making "binge-eating" videos where vloggers "usually leave a lot of food uneaten and often vomit what they have consumed" face fines of up to ¥100,000 (€13,905). All units and individuals have the right to report to the relevant departments and organs upon discovery of any act of wasting food by food producers and dealers. The departments and organs receiving such reports shall promptly handle them in accordance with the law. Besides, the leadership and responsibilities of governments at all levels are emphasized in the law to establish and improve the anti-food waste work mechanism, organize the monitoring, investigation, analysis and assessment of food waste, and strengthen supervision and administration.

Second, China invests in storage infrastructure. In China, over 50% of grain is stored by farm households, 25% by commercial enterprises and 25% by local and central governments. Losses of the latter ones are relatively low and similar to developed countries' level (HLPE, 2014). However, high storage losses are found at farm households. They are mainly caused by the poor storage infrastructure. A programme led by the National Food and Strategic Reserves Administration (NFSRA) aiming at improving farmers' grain storage infrastructure was piloted in three major grain production provinces in 2007 and expanded to 26 provinces in 2016 (NFSRA, 2020). The programme covers 8 million farmers and an estimated 5.5 million tonnes of farmers' grain storage. More than 100 million small barns have been built for farmers. Moreover, the NFSRA started to build grain post-harvest service centres in main grain producing counties in China in 2017. The centres provide cleaning, drying, storing, primary processing, and selling services to farmers. So far, more than 5,300 centres have been built in China (NFSRA, 2021).

Third, local and non-governmental campaigns are launched. A grassroots campaign that encouraged Chinese consumers to "Empty Your Plate" was launched in Beijing in 2013. In the beginning, the campaign encouraged people to spread the message of reducing food waste via Weibo, a Chinese social media site. More than 750 restaurants in Beijing participate in the campaign, which has also received considerable public support. Restaurants serve smaller dishes, encourage the use of doggy bags or offer discounts and certificates to customers who do not leave any food on their plate (FAO, 2019). The widespread attention that it received caught the attention of the central government, which later launched a series of policies to reduce food wastage. One such policy, which was linked to President Xi Jinping's wider anti-corruption drive, called for an end to lavish banquets hosted by government officials. The China Consumers' Association also asked restaurants to abolish minimum fees, which often result in customers ordering more food than they could eat to avoid an additional service charge. Besides the "Empty Your Plate" campaign, options for "small dish", "half dish", or "dish for one person" has been popular in many restaurants and food order and delivery platforms in China.

Fourth, consumer education and advocacy activities in the media have considerably increased since 2013. Along with the "Empty Your Plate" campaign, a series of public advertisements against food waste have been displayed by public media, the national and state-run TV station CCTV as well as a number of TV stations at provincial level, and on social media.

Fifth, China participates in the global collaboration for FLW reduction. It hosted the International Conference on Food Loss and Waste which was held in Jinan in September 2021 and attended by ambassadors to China from 16 countries and agricultural ministers from 24 countries. China wants to promote the establishment of an international mechanism for cooperation on FLW. The "Jinan Initiative" was released during the conference to call for global awareness, strengthening capacities, joint actions for reducing FLW, and contribute to the achievement of the UN's 2030 Agenda for Sustainable Development.

First estimated impact of these laws and regulations on FLW in China

Reduced food loss: Generally, the technological and infrastructural progress in Chinese food supply chains has contributed to less food loss. Although there is no impact evaluation particularly for the investment in reducing FLW, the trend of FLW reduction has been observed by comparing literature over several years. For example, the latest field survey for loss rates of staple food crops at the storage stage (0.6% in Lu et al., 2021) appears notably lower than earlier estimates (5.7 to 8.6% in Liu, 2014; 3.2% in Gao et al., 2016; 2.2% in Yin, 2017). The loss rate of staple food crops at all stages (7.9%) in the latest estimate is also lower than earlier estimates (13.5 to 18.5% in Ying et al., 2005). The same trend is observed for loss reduction of vegetables and fruits (Li et al., 2015; Lü et al.,

2018; Lu et al., 2021). The NFSRA has made a first estimate of impact of grain postharvest service centres. It reported that the grain loss rate at storage stage was on average reduced by 4 percentage points (NFSRA, 2021).

Changes after new legislation: The Anti-Food Waste Law has only been enacted this year. Therefore, it is too soon to solidly substantiate its impact. However, some changes and actions have emerged in governmental departments, industry groups, and media right after the new legislation. In June 2021, a notice of implementing the Anti-Food Waste Law was jointly introduced by the State Council's Food Safety Office, the Ministry of Education, the Ministry of Commerce, the State Administration for Market Regulation, and the National Government Offices Administration (The State Council of China, 2021). The notice requires food producers and businesses to improve their storage, transportation and processing mechanisms. It also requires canteens, food testing agencies and other entities to take more actions to curb food wastage. Specifically, the notice sets guidelines asking fast food delivery platforms to remind consumers to be judicious when ordering food and encourages school canteens to upload videos of their kitchen daily, to ensure transparency concerning food safety and quantity. Led by the Ministry of Commerce, scientists and food-related associates are working together to set guidelines and standards for assessing FLW along the food supply chains (Cheng, 2021). Culinary industry groups have started promoting “N-1” or “N-2” meals in cities like Wuhan, Zhuhai, and Changsha, which means the number of shared dishes when dining in large groups should be less than the number of guests. More and more restaurants have pledged to offer small-portion options. A survey conducted one month after the implementation of the Anti-Food Waste Law shows that 73.17% of respondents found restaurants put up posters encouraging customers not to waste food, 79.91% of respondents found restaurants and food delivery platforms have posted a new online "reminder" of suggested portions by number of people, and of avoiding over-ordering (Chuanguan News, 2021). As for actions by media, all the binge-eating videos have been removed from social media sites.

Recommendations for further FLW reduction in China

With growing affluence and urbanization, China's consumer food waste is expected to increase in the future as this has been observed in some industrialized countries. It is about time to integrate FLW reduction into China's national agenda and policy formulation. Government, private sector, and people have all increased their awareness for FLW reduction and have taken many actions. However, the policy framework to fight FLW is far from being completed. Many endeavours need to be invested in science and research, technology, and legislation. After reviewing existing policies, regulations, and actions inside and outside China, the following recommendations are given:

First, a holistic and scientific FLW measurement covering all food supply chain stages and all food categories is essential. It is also needed for setting an FLW reduction target such as the UN's SDG Target 12.3. At the moment, FLW measurement in China is still insufficient and a major constraint for FLW governance. The fragmented estimation of food waste mainly results from conceptual and methodological inconsistency and data scarcity. FLW data regarding stages of food supply chains and food categories is imbalanced. Only a few of the 107 FLW articles and reports published in China deal with FLW of meats (18.7%), seafood (3.7%), and milk (0.9%), which contains quality proteins. The share of publications on fruits and vegetables, the food category with the highest FLW, is rather low (6.5%). For stages of food supply chains, FLW estimation of farm-level storage, food services, retailing and households remains poorly understood. Moreover, existing FLW estimates for China are largely secondary in nature and literature derived, primary source data based on ground-level measurements are scarce. Therefore, it is fundamental to invest in research to obtain more reliable estimates and comprehensive understanding of the FLW in China, and to establish an interoperable system that harmonize FLW measurement and assessment at different levels (i.e. national and territorial aggregation, organizations and individuals).

Second, the opportunity of establishing an FLW reporting mechanism or innovative partnerships with industry associations and consortia, business platforms of food services, food service providers and private entities, and local governments needs to be explored. For example, since 2020, the EU member states have been obliged to annually report their FLW based on five levels of the food supply chain. Therefore, some member states take actions to monitor and collect data. In Germany, all stakeholders should be involved in developing prevention measures, collecting reliable data and collaboration (BMEL, 2019). China, at this stage, can explore an innovative way to cooperate with the private sector to monitor, report and share FLW data. The reporting mechanism is expected to be helpful in generating aggregated sectoral, provincial, and national FLW data, and in increasing accountability.

Third, it is necessary to invest in food supply chain technology. Food loss at storage stage has been distinctly reduced due to the improvement of storage infrastructure. However, there is still significant potential for further FLW reduction. Advanced and new technologies can help to reduce mechanical damage that occurs during harvesting and processing. Investing in cold chains can help to reduce food loss at distribution stage. Big data of high granularity in the private sector (e.g., platform business of food services) can be used to monitor FLW and to analyse causes for FLW at industrial as well as individual level (e.g., consumers' preference and behaviour).

Fourth, the law enforcement basis and inspection standards for the Anti-Food Waste Law should be improved. The current FLW legislation in China is not precise enough with regard to the law enforcement basis and inspection standards. More details need to be included such as the responsibility and accountability of each stakeholder in reducing FLW to a certain level. It is expected that recommendations 1 to 3 are helpful in offering evidence as basis for detailed FLW legislation standards.

Last, global collaboration on FLW in the fields of research, business and policy advocacy should be encouraged. With its important role in world economy and world food systems, China should foster global partnerships between scientists, policy makers, industries and civil society to achieve the SDG 12.3.

References

- BMEL. (2019) National Strategy for Food Waste Reduction. Federal Ministry of Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft), Berlin, February 2019, 20 pages, available at https://www.bmel.de/SharedDocs/Downloads/EN/Food/Strategy_FoodWasteReduction.pdf?__blob=publicationFile.
- Cheng, S. (2021). Food Loss and Waste in China. Presentation at the Independent Dialogue of United Nations Food Systems Summit. Beijing, September 15, 2021. (Chinese).
- Chuanguan News. (2021). Survey on implementing the Anti-Food Waste Law. (Chinese). <https://baijiahao.baidu.com/s?id=1702638850552651367&wfr=spider&for=pc>
- FAO (Food and Agriculture Organization of the United Nations). (2019). The State of Food and Agriculture 2019. Moving Forward on Food Loss and Waste Reduction.
- HLPE. (2014). Food losses and waste in the context of sustainable food systems. A report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2014.
- Li, C., Xiao, X., Zhang, Y. (2015). Comparison of different distribution modes and price formation of vegetables: a survey of vegetables from Shouguang in Shandong to Beijing (Chinese). *China's Rural Econ* 8, 53–66.
- Liu, G. (2014). Food Losses and Food Waste in China: A First Estimate, OECD Food, Agriculture and Fisheries Papers, No. 66. OECD Publishing.
- Lu, S., Cheng, G., Li, T., Xue, L., Liu, X., Huang, J., & Liu, G. (2022). Quantifying supply chain food loss in China with primary data: A large-scale, field-survey based analysis for staple food, vegetables, and fruits. *Resources, Conservation and Recycling*, 177, 106006.
- Lü, N., Peng, J., Zhao, R. (2018). The causes and countermeasures of potato loss at storage in Bashang. Northwest Hebei. *Farm Staff* 4, 55+11.
- NFSRA. (2021). The National Food and Strategic Reserves Administration: More than 5300 centers have been built in China. (Chinese). <https://baijiahao.baidu.com/s?id=1702893067220008588&wfr=spider&for=pc>
- The State Council of China. (2021). A notice of implementing the Anti-Food Waste Law. (Chinese). http://www.gov.cn/zhengce/zhengceku/2021-06/25/content_5620700.htm
- WWF (World Wide Fund for Nature). (2018). Report of Food Waste in Chinese Cities. (Chinese).
- Xue, L., Liu, X., Lu, S., Cheng, G., Hu, Y., Liu, J., Dou, Z., Cheng, S., Liu, G. (2021). China's food loss and waste embodies increasing environmental impacts. *Nat. Food*. 2021 2 (7), 519–528.
- Yin, G., 2017. Estimation of postharvest loss and reduction countermeasures for grain in China in Recent Years (Chinese). *Cereal Feed Ind* 1–3.

Ying, X., Zheng, W., He, Y., 2005. Systematic analysis and optimization of grain postprocessing model (Chinese). J. Zhejiang Univ. (Agriculture Life Sci.) 31, 337–340.

Disclaimer:

This policy brief is published under the responsibility of the Sino-German Agricultural Centre (DCZ), which is funded by the German Federal Ministry of Food and Agriculture (BMEL). All views and results, conclusions, proposals or recommendations stated therein are the property of the authors and do not necessarily reflect the opinion of the BMEL.

Published by:

Sino-German Agricultural Centre

Reprints or reproduction of any kind only with permission of the publisher.

About the author:

Dr. Jiaqi Huang is Assistant Professor at the Agricultural Information Institute of Chinese Academy of Agricultural Sciences. She holds a Ph.D. in Economics from Wageningen University in the Netherlands. Her research interests include food economics, especially food security and nutrition of rural households, food systems, development economics, and behavioural economics.

About the project:

The Sino-German Agricultural Centre is a joint initiative of the German Federal Ministry of Food and Agriculture (BMEL) and the Ministry of Agriculture and Rural Affairs of the People's Republic of China (MARA). It was established in March 2015 as a central contact and information point and for coordinating bilateral cooperation between Germany and China in the agricultural and food sector. The DCZ brings together stakeholders from the public and private sector and the scientific community. It creates forums in which agricultural issues of common interest are addressed. The spectrum of Sino-German cooperation in the agricultural sector is reflected in the three components of the DCZ: Agricultural Policy Dialogue, Agri-Food Business Dialogue and Scientific Dialogue. Further information can be found on the project website.

<https://dcz-china.org/en/the-project.html>