

# Research on the Optimization of Anti-food Waste Policy on the Electronic Platform of Surplus Meals from the Perspective of Policy Tools

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## Abstract

Food waste in the catering industry has become a prominent problem in the sustainable development of global resources, and the lack of compliance disposal channels for surplus meals of individual catering merchants is the core blockage of the current grain conservation and loss reduction work. At present, China's anti-food waste policy has not formulated special rules for surplus meal electronic platforms, and there are four major system gaps: supervision, incentives, supporting and coordination. This study employs the literature research method, policy text analysis method and normative analysis method, grounded in circular economy theory, transaction cost theory and policy tool theory. It clarifies the boundary for the compliant sales of surplus meals, identifies the core deficiencies of existing policies and analyzes their underlying causes. Finally, a four-dimensional policy optimization path is proposed, covering supervision improvement, incentive enhancement, supporting system supplementation and collaborative governance. The research results can provide practical reference for the improvement of China's food conservation and anti-food waste policy system, and help reduce food waste and improve the efficiency of food resource utilization in catering.

## Keywords

Food safety, Food waste, Circular economy, Policy tools, Individual catering merchants, Policy optimization

## Introduction

Food waste has become a prominent bottleneck that threatens national food security and restricts the sustainable use of global resources and ecological environmental protection. According to the "Food Waste Index Report 2024" released by the United Nations Environment Programme (UNEP), the total amount of food waste in the world reached 1.052 billion tons in 2022, and the total annual food waste per capita was 132 kg. Among them, food waste in the catering service sector accounts for about 30.0% of the total global food waste [1]. It exerts a significant negative impact on global food security, resources, the environment, and socio-economic development [2-4]. Furthermore, it directly violates the core requirements of the United Nations Sustainable Development Goal 12: "responsible consumption and production".

In China, the official implementation of the Anti-Food Waste Law of the People's Republic of China has brought food waste management in the catering sector

fully into the track of rule of law. Subsequently, policy documents including the Food Conservation Action Plan and the Anti-Food Waste Work Plan have been issued successively, further clarifying the requirements for loss reduction across the entire grain chain. However, ready-to-sell hot food produced and sold on the same day - such as Chinese box lunches and buffets - with an extremely short shelf life remains a weak link in grain conservation and loss reduction. Individual catering merchants with formal business qualifications are forced to discard a large number of still-edible surplus meals due to the lack of compliant and low-cost disposal channels. This situation has become a prominent bottleneck in catering food waste management. According to the data of the Fifth National Economic Census, at the end of 2023, there were 10.922 million self-employed households in China's accommodation and catering industry, accounting for 93.2% of the total number of business

entities in the industry. However, mainstream online food delivery platforms currently do not provide exclusive channels for the disposal and sale of surplus meals. In addition, independent surplus meal sales applications on the market struggle to meet the business needs of most small and micro merchants, leading to the direct discarding of large quantities of surplus meals that remain within their safe consumption period [5]. This practice not only results in the unnecessary waste of valuable food resources but also increases the burden of social kitchen waste disposal and causes economic losses for merchants.

In general, there are obvious academic research gaps in the existing research: First, the existing research mostly focuses on the food waste management of large catering enterprises, government agencies, and school canteens, and there is still a lack of relevant special research on individual catering merchants, which account for more than 93.0% of the industry entities [6,7]. Second, the research on the digital sales of surplus meals mostly focuses on the analysis of platform operation mode and consumer acceptance, there is a lack of special policy optimization research for this subdivision scenario from the perspective of policy tools [8]. Third, the existing research has not yet built a full-chain policy system that adapts to individual catering merchants and surplus meal electronic platforms, which cannot provide institutional support for the large-scale implementation of the model. From the perspective of policy practice, China's existing policies only set out principled encouragement for the resource utilization of surplus food. They have not developed operable and targeted regulatory rules or special incentive policies for electronic sales platforms that handle boxed lunches and buffet surplus meals from individual catering merchants. This directly results in a lack of clear institutional guidance for such models, making large-scale promotion difficult to achieve.

In view of the above-mentioned academic gaps and practical obstacles, this study is different from existing general research on anti-food waste policies. Taking mandatory, hybrid and voluntary policy tools as its core analytical perspective, it focuses precisely on the neglected key group of individual catering merchants. Using literature research, policy text analysis and normative analysis, this paper constructs a policy

optimization system suitable for this specific scenario.

## **Core concepts and theoretical foundations**

### ***Definition of core concepts***

(1) Individual catering merchants: Referring to those who have fixed business premises and hold business licenses and food business licenses in accordance with the law, an individual industrial and commercial household mainly engaged in the production and sale of hot food products.

(2) Chinese boxed lunch/buffet surplus meals: It refers to freshly prepared hot food that is cooked on the same day and meets food safety operation specifications. Such food has not exceeded its safe consumption period and remains unsold by the end of business hours. In addition, it cannot be stored and resold on the following day.

(3) Exclusive electronic sub-platform for surplus meals: Referring to the special connection with individual catering merchants to carry out surplus Chinese lunch boxes in accordance with regulations, buffet shelf, sales, and distribution services.

(4) Anti-food fee policy: It refers to the general term for laws, regulations, regulatory rules, incentive policies and supporting provisions issued by national and local authorities. These policy instruments are formulated to reduce catering food waste and promote the source utilization of surplus meals.

### ***Rationale basis***

#### **(1) Environmental economic theory**

The core of the theory of circular economy follows the three principles of reduce, reuse, and recycle, and breaks the "production-consumption-discard" traditional linear economic model to achieve resource following efficient utilization of the environment [9]. The regular sale and reuse of surplus meals represent a typical application of environmental economic theory in the catering industry. This practice can effectively reduce the waste of food resources and improve the utilization efficiency of catering resources [10]. Meanwhile, it aligns with the core goal of anti-food waste.

#### **(2) Transaction cost theory**

The transaction cost theory believes that there are costs such as search, negotiation, and supervision in market transactions, and reasonable systems and carriers can effectively reduce these transaction costs. The exclusive

electronic sub-platform can break down the information barriers between merchants and consumers, reduce search costs and operating costs through digital means, and promote the efficient circulation of surplus resources [11].

### (3) Policy instrumental theory

According to policy tool theory, policy tools are classified into three categories: coercive tools, hybrid tools, and voluntary tools. Coercive tools include regulation, public administration, and direct provision. Hybrid tools cover subsidies, information and admonition, and property auctions, while voluntary tools consist of families and communities, volunteer organizations, and markets. The combination of different types of tools can improve the effectiveness of policy implementation - mandatory tools ensure bottom-line supervision, and hybrid tools provide incentive guidance, voluntary tools to promote social participation. This paper applies this theory to analyze the imbalance in the allocation of existing policy tools. On this basis, it constructs a rational policy tool mix to support the implementation of the circular utilization model for surplus meals.

### **The policy basis for the sales of surplus meal electronics sub-platforms**

#### *Top-level legal support*

Article 2 of the Anti-Food Waste Law of the People's Republic of China clearly defines the concept of food waste. It refers to the failure to rationally utilize safe-to-eat or drink food in accordance with its intended function, including discarding food or reducing its quantity or quality through irrational use. Article 23 of the Law clearly encourages food producers and operators to sell surplus unsold food on the same day at a reasonable price through information platforms, in-store discount sales and other means, on the premise of ensuring food safety. This provision provides the core legal basis for the platform-linked sales model investigated in this paper. Simultaneously, Article 24 encourages the establishment of incentive and guidance mechanisms to support market entities to participate in food waste reduction activities through donations, volunteer services, etc. Article 35 of the Food Safety Law of the People's Republic of China stipulates that the state implements a licensing system for food

production and operation. Entities engaged in catering services must obtain a food business license in accordance with the law. This provision sets out basic food safety requirements for catering services and online food sales, ensuring full-process food safety compliance in the sale of surplus meals [12].

The "Food Safety Operation Specifications for Catering Services" clearly stipulates that freshly prepared and ready-to-sell hot food shall be stored for no more than 2 hours at room temperature, no more than 4 hours above 60°C, and no more than 24 hours when refrigerated below 10°C. This regulation clearly defines the boundaries for the safe sales of surplus meals. The "Online Catering Service Food Safety Supervision and Management Law" imposes qualification review obligations on online catering platforms. It requires platforms to verify the food business licenses of online catering service providers and confirm that such providers have physical operating stores and hold valid food business licenses in accordance with the law. This law provides clear operational compliance guidelines for the operation of dedicated surplus meal electronic platforms.

The "Food Waste Reduction Action Plan" clearly encourages food producers and business operators to sell surplus food through promotions and donations to reduce food waste. It also supports the development of information platforms to connect the supply and demand of surplus food and promote the resource utilization of edible food [13]. The Anti-Food Waste Work Plan further requires promoting the establishment and improvement of anti-food waste industry standards in the catering sector, encouraging industry associations to formulate relevant rules and regulations, and guiding catering enterprises to voluntarily carry out food reduction initiatives. These requirements provide directional support for the subsequent optimization of relevant policies.

### **The current status and core shortcomings of policy implementation**

#### *Implementation status of relevant policies*

The existing regulatory policies follow the general specifications of online catering and food safety, and do not formulate special regulatory rules for the sale of surplus meals, which is insufficiently targeted. Existing

incentive policies remain merely at the level of principled encouragement and lack dedicated fiscal, taxation, and administrative support for both dedicated electronic platforms and individual catering merchants. Owing to such insufficient incentives, it is difficult to effectively stimulate the enthusiasm of market entities in participating in relevant practices. Currently, only a handful of Chinese cities, including Shanghai and Chengdu, have conducted sporadic pilots for the digital sale of surplus meals, while mainstream takeaway platforms have merely launched scattered temporary discount sections for surplus food. A unified set of national policy norms and promotion models has not yet taken shape, leaving the entire industry still in an exploratory stage without clear regulatory guidelines.

#### ***There are core policy shortcomings***

(1) Ambiguous regulatory rules: From the perspective of transaction costs, such regulatory ambiguity heightens the uncertainty of merchant compliance and raises the operational costs of platforms. Currently, no dedicated standards exist for the labeling, sales, and distribution of surplus meals, and the division of food safety responsibilities between platforms and merchants remains indistinct. Moreover, the absence of targeted regulatory provisions implies that the supervision of this emerging business model lacks clear rules and institutional guidance.

(2) The lack of targeted incentive policies: This situation reflects the inadequate supply of hybrid policy instruments within the existing policy framework. Specifically, there is a lack of targeted financial subsidies for dedicated platforms, preferential tax policies, simplified registration procedures for merchant onboarding, and operational incentives for compliant sellers of surplus meals. As a result, the motivation and initiative of market entities to participate remain insufficient.

(3) Insufficient supporting system: There is a lack of practical operational guidelines for merchants and science popularization and publicity materials for consumers. No fault-tolerance mechanism is provided for non-subjective violations committed by platforms. All these problems lead to great difficulties in policy implementation.

(4) The absence of a cross-departmental collaborative supervision mechanism: The digital sales of surplus

meals involve multiple regulatory departments, including market supervision, commerce, and development and reform. Existing policies fail to clarify the respective regulatory rights and responsibilities of these departments. Nor have they established a normalized cross-departmental collaborative working mechanism.

#### **Analysis of the causes of policy shortcomings**

##### ***Supervision rules lag behind the development of new business formats***

Traditional catering supervision policies are formulated for conventional meal services, with their regulatory logic and rules designed accordingly. Such policies are not applicable to the emerging scenario of digital sales of surplus pre-prepared and ready-to-sell meals. The update of the regulatory system lags behind the development pace of this business format, leading to insufficient adaptability in supervision and governance.

##### ***The configuration of policy tools is unbalanced***

Currently, relevant policies rely excessively on compulsory regulatory instruments, while the supply of hybrid incentive tools - including fiscal subsidies, tax incentives, and administrative simplification - remains severely insufficient. This results in weak policy guidance and incentive effects, implying that it is difficult to foster the healthy development of emerging business formats by relying solely on regulatory constraints.

##### ***The implementation of market transaction cost restriction policies***

High costs for individual merchants in complying with regulations for surplus meal disposal, difficulties in achieving profitability for dedicated platform operations, and low consumer trust in surplus meals jointly result in elevated market transaction costs that constrain model implementation. Consequently, the intended effects of policy implementation have not yet been attained.

##### ***The cross-departmental collaborative governance system is not perfect***

Existing policies have not established a normalized cross-departmental collaborative working mechanism, and relevant requirements and implementation standards vary across departments, making it difficult to form effective policy synergy. This dilemma directly restricts the nationwide promotion and application of the digital sales model for surplus meals.

## **Suggestions on the optimization of policies for the circular utilization of surplus grain resources**

### ***Improving mandatory supervision policies and clarify the boundaries of compliance***

Formulate exclusive labeling standards for surplus meals, and clearly mark the production time, safe consumption time and food safety tips. Clarifying the division of food safety responsibilities between electronic platforms and settled merchants, and refine the clarification of rights and responsibilities. Standardizing the temperature and process control requirements for surplus meal distribution, strictly abide by the bottom line of food safety, and ensure that the new business format is under supervision and management.

### ***Strengthening hybrid incentive policies to reduce operating costs***

Providing special financial subsidies and tax reduction support to the exclusive electronic sub-platform for surplus meals to reduce the operating costs of the platform. Simplifying the filing process for individual merchant platforms and compressing the processing time limit. Individual merchants who sell surplus meals in accordance with regulations will be given business incentives and credit bonus incentives to mobilize merchants to participate Positivity.

### ***Supplementing voluntary supporting policies to guide market participation***

Compiling and distribute practical guidelines for the disposal of surplus meals for individual merchants and popular science manuals for consumers to improve market awareness and acceptance. Establishing self-discipline regulations for anti-wave fees in the catering industry and promote self-contracting in the industry bundle. Building a platform operation model that combines public welfare attributes and commercial attributes to achieve sustainable operation.

### ***Establishing collaborative supervision and fault tolerance mechanisms***

Formulating a fault-tolerant list of non-subjective violations, and implement tolerance and prudence for new business formats supervision. Establishing a multi-departmental collaborative supervision mechanism such as market supervision, commercial affairs, development and reform, and open policies. Enforcing blockages to improve the efficiency and

implementation effect of policies.

## **Conclusion**

This paper clarifies the compliance boundaries for the sales of surplus meals on electronic platforms by individual catering merchants and sorts out four core shortcomings, namely ambiguous policy supervision, insufficient incentives, inadequate supporting facilities, and lack of coordination. It further digs deep into four deep-seated causes, including lagging supervision, an imbalance of policy tools, high transaction costs, and an imperfect collaborative system. Finally, this paper constructs a policy optimization system covering four dimensions: supervision, incentives, supporting mechanisms, and collaboration. The optimized policy system can effectively promote the digital recycling of surplus meals, reduce catering waste, improve the efficiency of grain resource utilization, and balance ecological benefits, merchant economic benefits and consumer welfare. It also provides a practical reference for improving China's policy system for grain conservation, loss reduction and anti-food waste. In addition, this study also fills the gap in the policy optimization of digital sales of surplus meals by individual catering merchants, and corrects the limitation of the existing anti-food waste policy research focusing on large entities.

This paper mainly adopts the policy text analysis method, without field research and empirical testing, and there are certain research limitations. In the future, empirical research can be carried out by combining the actual operation data of the platform to further optimize the policy system. At the same time, the research model can be expanded to more catering subcategories to promote the high environmental economy of catering qualitative development. It can also be combined with the pilot practice of digital sales of surplus meals in different regions to carry out comparative analysis to further improve the regional adaptability of the policy system.

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**Conflict of Interest**

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**References**

- [1] Choi, Y. J., Lee, C. H. (2025) Food waste recycling through co-design: Motivating youth behaviour change. *The Design Journal*, 28(6), 1241-1260.
- [2] Gouvea, R., Kapelianis, D., Li, S., Terra, B. (2022) Innovation, ICT & food security. *Global Food Security*, 35, 100653.
- [3] Barrett, C. B. (2021) Overcoming global food security challenges through science and solidarity. *American Journal of Agricultural Economics*, 103(2), 422-447.
- [4] Amicarelli, V., Lagioia, G., Bux, C. (2021) Global warming potential of food waste through the life cycle assessment: an analytical review. *Environmental Impact Assessment Review*, 91, 106677.
- [5] Moltene, L., Orsato, R. J. (2021) The sharing economy in practice: an exploratory study of the acceptance and use of digital platforms in food waste reduction. *Revista de Administração de Empresas*, 61, e20200469.
- [6] Oláh, J., Kasza, G., Szabó-Bódi, B., Szakos, D., Popp, J., Lakner, Z. (2022) Household food waste research: the current state of the art and a guided tour for further development. *Frontiers in Environmental Science*, 10, 916601.
- [7] Yang, X., Chen, X., Xiao, X., Xi, H., Liu, S. (2021) College students' willingness to separate municipal waste and its influencing factors: a case study in Chongqing, China. *Sustainability*, 13(22), 12914.
- [8] Coşkun, A., Özbük, R. M. Y. (2020) What influences consumer food waste behavior in restaurants? An application of the extended theory of planned behavior. *Waste Management*, 117, 170-178.
- [9] Le, T. T., Behl, A., Pereira, V. (2024) Establishing linkages between circular economy practices and sustainable performance: the moderating role of circular economy entrepreneurship. *Management Decision*, 62(8), 2340-2363.
- [10] Tamasiga, P., Miri, T., Onyeaka, H., Hart, A. (2022) Food waste and circular economy: challenges and opportunities. *Sustainability*, 14(16), 9896.
- [11] Aparicio, D., Metzman, Z., Rigobon, R. (2024) The pricing strategies of online grocery retailers. *Quantitative Marketing and Economics*, 22(1), 1-21.
- [12] Okpala, C. O. R., Korzeniowska, M. (2023) Understanding the relevance of quality management in agro-food product industry: from ethical considerations to assuring food hygiene quality safety standards and its associated processes. *Food Reviews International*, 39(4), 1879-1952.
- [13] Zheng, M., Zhang, S., Zhang, Y., Hu, B. (2021) Construct food safety traceability system for people's health under the internet of things and big data. *IEEE Access*, 9, 70571-70583.