Original Research

How Reference Dependence and Network Embeddedness Shape Residents' Food Waste Behavior? Evidence from China

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Abstract

Reducing food waste is an important initiative to ensure food security and mitigate climate change. Previous studies have largely ignored the influence of reference points on food waste behavior and the role of human-to-human relational interactions, failing to capture their role in guiding residents' food waste behavior (RFWBs). To address this gap, this study proposes a model that examines the role of reference dependence, normative internalization, and symbolic expectations in RFWBs, while introducing network embeddedness as a moderating variable. Using data collected from 981 respondents online, ordinary least squares were used to test the hypotheses. The results showed that reference dependence and normative internalization had a positive effect on reducing RFWBs with regression coefficients of 0.178 and 0.293 respectively, while symbolic expectations also had a positive effect on RFWBs with a regression coefficient of 0.227. Additionally, Network embeddedness played a significant moderating role in reference dependence, normative internalization, and symbolic expectations with RFWBs. This paper is theoretically innovative and the relevant findings fill the current research gap in the field of food waste, providing guidance and reference for government departments to formulate policies and promote residents to implement food waste reduction behaviors.

Introduction

Food waste, an important current reality of global concern, not only affects food security and supply [1], but also has a negative impact on socio-economic and environmental sustainability [2]. According to the Food and Agriculture Organization of the United Nations (FAO), about 1/3 of the world's food is lost and wasted during production and consumption each year, and the carbon footprint of disposal is equivalent to 3.3 billion tonnes of greenhouse gases emitted into the atmosphere [3]. Wang et al. [4] demonstrated that China's carbon emissions will reach 689,257 ten thousand tons by 2025. Niu et al. [5] also show that food waste in China was 56.75 million tonnes in 2018. If greenhouse gas emissions from land use change are ignored, the carbon footprint from food waste is 168.07 Mt.CO2eq, which

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is 1.44% of China's total greenhouse gas emissions. Without strong interventions, the carbon footprint of food waste could reach 9 9.25 million tonnes in 2025, this is a huge impact on human survival. And studies have shown that without major policy adjustments or behavioral changes, global per capita food waste will double by 2050 [6, 7]. With the accelerating pace of global economic development, food waste in developing countries is becoming increasingly critical. It is estimated that between 2014 and 2018, approximately 27% of the food produced for residential consumption in China was lost or wasted each year [8], and the total amount of food waste is still on the rise [9], which shows that the food waste problem in China is very serious. Therefore, it is extremely important to explore the factors influencing residents' food waste behavior to mitigate and eliminate food waste at the consumer level.

Parfitt et al. [7] define a decline in food quantity caused by subjective consumer factors in the retail and consumption chain as food waste. Currently, many elements, such as family members [10], household economic income [11], sociodemographic characteristics [12], cultural characteristics [13], attitudes, subjective norms, perceived behavioral control and individual behavioral awareness [14-16] have been identified as influencing factors of food waste behavior. The existing literature on food waste behavior has mainly focused on individual-level factors, with little consideration given to person-to-person interactions. Network embeddedness is closely related to person-to-person interaction. To be specific, network embeddedness refers to the fact that most behaviors of real-life individuals or organizations are closely embedded in a network of social relationships [17], which can be divided into relational embeddedness and structural embeddedness. Relational embeddedness refers to the trust and quality of interpersonal relationships between individuals. Structural embeddedness refers to the social connection and position occupied by individuals in the network, as well as the strength of ties and interactions between individuals [18], and it is a manifestation of the dynamic interactions of social members. In other words, it is individuals' responses to actual actions based on trust and the strength of interactions between individuals. It has been shown that the psychological references generated by network embeddedness can effectively promote pro-environmental behavior [19]. Ma et al. [20] demonstrated that people with high social frequency are key to increasing awareness of pro-environmental behavior. Therefore, it is important to study the effect of network embeddedness on residents' food waste behavior.

Traditional decision theory assumes that people's decisions are rational and utility-maximizing, but many studies have confirmed that irrational factors influence people's decision-making processes [21]. Scholars have conducted experimental studies on reference dependence, with Kahneman and Tversky arguing their judgments and evaluations are derived by comparing them to a pre-established reference point because consumers have loss aversion and risk preference traits [22]. Studies have shown that reference points have a significant impact on consumers' purchase intentions [23]. Moreover, normative internalization results from limited rationality [24], as in complex social interactions, it is difficult to measure the benefit-cost of complying with or violating social norms. In that case, people in reality make actions governed by rules and respond to a complex world with simple decision rules to reduce the risks associated with decision-making [25]. TPB argues that the more positive the subjective norm for a particular behavior, the stronger the individual's willingness to act [26]. Existing research suggests social norms can influence food choice and intake by altering self-perceptions or changing sensory or hedonic evaluations of food [27]. Finally, with the gradual replacement of commodity consumption by symbolic consumption [28], symbolic expectations have become an important factor in exploring pro-environmental behavior. It highly related the theoretical development of symbolic expectations to the theory of symbolic interactionism [29]. It means social or primary reference group interactions heavily influenced consumers. Symbolic interaction in consumption behavior is symbolic consumption. Ritual behavior theory considers symbolic consumption to be a ritual act [30], and of the four constituent elements of ritual behavior - role, audience, script, and symbol - the brand is the symbol in the ritualized act. Studies have shown that the symbolic value of different cloud terminals has different effects on consumers' acceptance and purchase decisions [31]. Based on the above discussion, reference dependence, normative internalization, and symbolic expectations give new ideas to study the impact of food waste behavior.

The purpose of the study is to investigate the effects of reference dependence, symbolic expectations, and normative internalization on residents' food waste behavior (RFWBs), to investigate the moderating role of network embeddedness in this, and thus provide targeted policy recommendations to reduce food waste behavior. The significance of work includes: applying network embeddedness as a moderating variable to the study of food waste behavior, which promotes the development of a wider application of social network embedding theory; constructing a model of the influence of residents' food waste behavior, including three independent variables of reference dependence, symbolic expectations, and normative internalization, which provides a new theoretical model for research in this area and provides new variables and reference models.

Research Hypotheses

The Impact of Reference Dependence on RFWBs

Reference dependence refers to the fact that residents' judgments are often derived by comparing them to a reference point established in advance with the status quo or expectations. When residents are in a group with a strong perception of food waste reduction due to loss aversion, they will be influenced by the group's perception of food waste and food waste reduction behaviors, and make decisions with reference to group information, following group norms and reducing differences from the group, thus exhibiting reference dependence characteristics. For example, when faced with multiple products, consumers are more likely to choose the compromise option over the extreme option under the influence of the trade-off effect because the compromise option can decrease decision risk compared to the extreme option [32].

According to the anchoring effect, people tend to associate estimates of the future with estimates already used and are susceptible to the influence of others' advice. Studies have shown that individuals show convergence when others share the same views or adopt similar behaviors during individual information processing [33]. Individuals' decisions unconsciously show agreement and support for the information provided by the outside world to which they are exposed to. In a study related to pro-environmental behavior, Zhang et al. [34] demonstrated that positive information about an individual's surroundings can effectively improve an individual's waste-sorting behavior. In addition, social comparison theory suggests that people tend to enter a group with which they agree based on their judgments and that when there are differences in opinion or competence in the group, this will lead members of the group to take action to reduce the differences [35]. In other words, through social comparison, homogeneous groups are formed and people will accept the behavior of others. In the case of food waste behavior, residents use the group's food waste behavior as a reference point to determine whether their own behavior matches the reference point, and if there is a difference, they take action to reduce it. As the group practices more food waste reduction behaviors, residents will refer to the group and thus reduce food waste. Existing research supports this conclusion, for example, Bruchmann et al. [36] confirmed that referencing group information can motivate sustainable behavior change.

According to the above description, residents often made decisions based on group reference points. When the norm and value of the group the resident is in is food conservation, the resident will follow the group norm to practice food waste behavior to reduce differences from the group and increase the sense of belonging to the group. And it has been shown that reference points lead to customers' intentions to reduce food waste when

the reference point changes to the environment [37]. Therefore, this paper proposes that:

H1: Reference dependence has a positive effect on the reduction of RFWBs.

The Effect of Normative Internalization on RFWBs

Social norms act on people's cognitive activities at the psychological level [38], causing people to consider whether their behavior conforms to social norms before making decisions, and then internalize this process, called normative internalization. As far as wasting is concerned, residents deeply consider whether their food purchases are normative and wasteful based on the moral norms of society before purchasing or consuming food. Several studies have also confirmed that normative internalization can have an effect on pro-environmental behavior [39, 40].

Social identity theory suggests that individuals identify with their own group through social comparison and group identification, and develop in-group preferences and out-group biases [41]. In food waste behavior, if people identify themselves as in-group (e.g., those who practice food waste reduction behaviors), they will develop a sense of belonging to the in-group and conform to the in-group norms. If people identify themselves as an out-group, they will not develop in-group-specific norms, thus showing less pro-environmental behavior. Existing research confirms that individuals are more likely to perceive themselves as strongly environmentalist and practice pro-environmental behavior when tending to embrace the environmentalism of their community [42]. Additionally, corresponding to social cognitive theory, moral identity is the crucial psychological mechanism by which individuals' moral cognition transforms into moral behavior. And then the continuous integration with social norms forms a stable moral trait in individuals themselves, which is essentially a self-regulatory mechanism that requires individuals to follow social norms [43], and individuals with different moral identities show a different willingness to behave. Internalizing norms is essentially a process by which individuals reduce risk by following social norms, and studies have shown that following social norms in complex social environments results in higher benefits [44]. Combined with the unique significance of reducing food waste, the constraints that normative internalization imposes on individual behavior stem, on the one hand, from a general concern for people's social image to avoid stigmatizing punishment or to achieve some honorable goal [45]. On the other hand, Social Norms can also make people develop an internal instinct to comply with them by influencing their cognitive level [46]. The higher the level of internalized norms in buying or consuming food, the greater the perceived pressure from external sources, as the violation of group norms can lead to negative consequences for oneself

and unpredictable risks, and the tendency to practice a norm to avoid stigmatizing punishment and maintain a good social image [47]. It has also been shown that ethical norms have a positive impact on the intention to reduce food waste and that the intention to reduce food waste significantly determines food waste behavior [48, 49]. Therefore, this paper proposes the hypothesis that:

H2: Normative internalization has a positive effect on the reduction of RFWBs.

Impact of Symbolic Expectations on RFWBs

Symbolic expectations refer to the fact that consumers purchase food not only for the value of function but also for external utilities such as subordination, uniqueness, and prestige. These external utilities reflect the fact that symbolic expectations are external values that differ from consumers' subjective perceptions, and are internal expressions of the approval consumers receive from the outside world through their food consumption.

The theory of consumer value proposed by Sheth et al. suggests that consumers can derive functional value from the functional, practical, or physical attributes of substitutes and measure the social value derived from the association of substitutes with a particular social group by choosing their image. In addition to the perceived utility derived from the ability of substitutes to evoke emotions or emotional states [50]. In other words, goods can bring different levels of perceived efficacy to consumers. Perry et al. [51] argue that goods have non-functional requirements like the Veblen effect besides functional requirements. Patsiaouras et al. [52] reveal that conspicuous consumption is to gain social prestige and improve social status through consumption. At the level of interpersonal influence, excess food and food prices allow residents to gain perceived efficacy, and they can reflect their social prestige, status, and wealth, which has a certain bragging value, leading to excessive purchases and further increasing the likelihood of food waste. Rocha et al. [53] argue the point by suggesting that consumers categorize themselves with others and reflect their class status by bragging about consumption, and food waste ensues. In addition, Steg et al. [54] note that consumers enjoy the physical or sensory pleasure and satisfaction that objects provide and that the over-purchase and use of consumer goods may trigger emotions that individuals anticipate when making decisions, and Tsai [55] argues that self-emotions can be enhanced and managed through product or brand used to maintain positive emotions or get rid of negative ones. Existing research suggests overbuying is the most important proximal driver of self-reported food waste [56]. Positive and negative emotions mediate the constructs that influence food waste behavior, and mood swings can exacerbate individuals' food waste behavior [57]. Therefore, this paper proposes that:

H3: Symbolic expectations have a positive effect on RFWBs.

The Moderating Role of Network Embeddedness

Network embeddedness refers to the complex social environment in which most behaviors of real-life individuals or organizations are closely embedded in a network of social relationships, and the relatively stable social network relationships constituted by network members have an important influence on knowledge and information interaction. Specifically, network embedding can be explored in two dimensions: relational embedding and structural embedding [58].

The intensity of trust and interaction in network embedding increasingly enhances residents' social identity and collective action intentions [59]. According to social comparison theory, residents will follow group norms and group values to reduce their differences from the group and adjust their behavior so as not to be rejected by other group members [35]. Thus, network embedding will promote a convergence in the group's sense of values, which will have a positive effect on reducing RFWBs. Secondly, according to the embedding theory proposed by Granovetter [17], its main emphasis is on the role of specific personal relationships and the network structure of these relationships in generating trust and discouraging lawlessness. It was previously noted that residents tend to follow social norms to avoid the unpredictable risks incurred by violating group norms and to maintain a good image of themselves. We can infer that the role of encouraging individuals to participate in group behavior and discouraging lawlessness generated in network embeddedness can have a synergistic effect on the external social pressure generated by the internalization of norms. Specifically, the level of interpersonal trust and the intensity of interaction in network embeddedness may constrain residents' food waste behavior, while the internalization of norms may lead to a tendency to follow the concept of reducing food waste. Therefore, network embeddedness will further promote food waste reduction. In addition, in social network relationships, trust allows people to 'bridge' with people in the social sphere, facilitating access to information resources outside the group [60] and promoting individual perceived efficacy [58], and individuals will continue to enhance the information constructed by social networks based on the information resources they hold. Individuals will continue to enhance their influence and voice in the information 'circles' constructed by social networks [61], expressing themselves through symbolic expectations, and in the process gaining external utility, such as social status, wealth and emotional satisfaction. Therefore, in the process of transmitting food information, the increase in the strength of network embeddedness will enhance residents' symbolic expectations and further contribute to the occurrence of RFWBs. Therefore, this paper proposes that:

H4: Network embeddedness positively moderates the relationship between reference dependence and reduction of RFWBs;
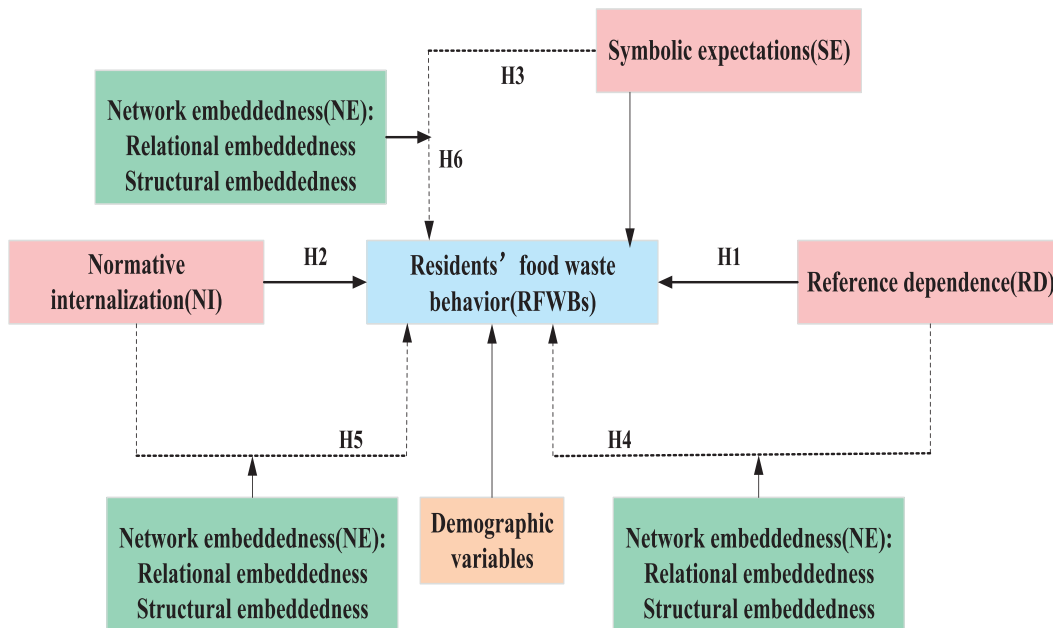
Fig. 1. Conceptual research framework.

H5: The relationship between network embeddedness positive regulation of normative internalization and reduction of RFWBs;

H6: The relationship between network embeddedness forward regulation of symbolic expectations and RFWBs.

The research model in this paper is shown in Fig.1.

Material and Method

The research framework of this study was divided into three steps, as shown in Fig. 2. First, a theoretical model incorporating reference dependence, normative internalization, and symbolic expectations was developed, and network embeddedness was used as a moderating variable. Next, a questionnaire survey was conducted to collect data for measurement. Finally, the effects of each variable on RFWBs were determined.

Sample and Data Collection

The questionnaire was conducted on the Questionnaire Star (https://www.wjx.cn/) platform. The purpose of the study was briefly explained on the first page of the questionnaire to address the concerns of the respondents. The questions of the questionnaire were designed according to the variables to be measured. The five-point Likert scale has proven to be the most reliable instrument for collecting questionnaire data in questionnaires [62]; therefore, the questionnaire in this study was designed based on the five-point Likert scale.

The initial survey was conducted in Nanjing from September 2 to 20, 2022, and after deleting 23
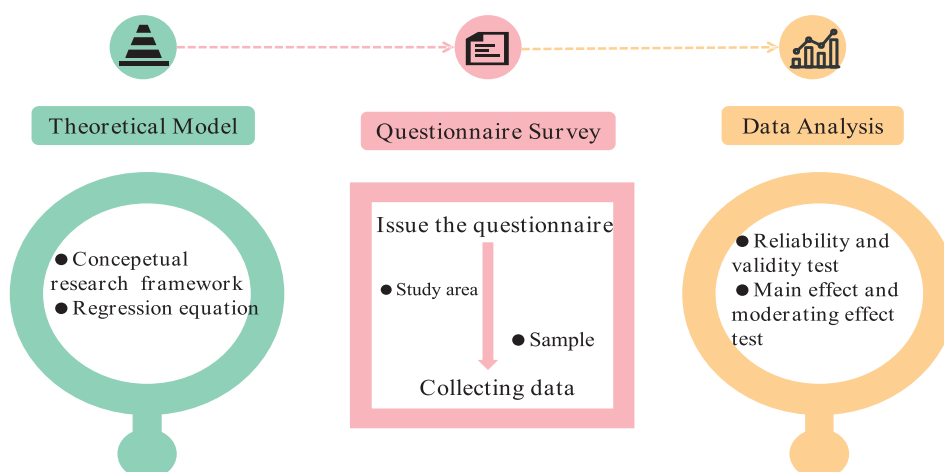

Fig. 2. Research framework.

invalid questionnaires, 107 valid questionnaires were collected. The initial scale was tested for Reliability and validity using SPSS, and the results showed that the questionnaire had good Reliability and validity. In addition, the questionnaire was modified based on the initial respondents' feedback and comments to ensure that each question item was easy to understand. The official survey was collected via an online questionnaire from September 22 to October 29, 2022, with coverage to all parts of the country. Key variables such as reference dependence, normative internalization, symbolic expectations, and network embeddedness were explained to the respondents before they completed the questionnaire. A total of 1127 questionnaires were collected, and after excluding invalid questionnaires, a total of 981 valid questionnaires were collected, with an effective rate of 87.05%. The demographic information of the sample is shown in Fig. 3. In terms of gender composition, women (53.55%) were slightly higher than men (46.45%); in terms of age composition, the highest percentage was between 30-45 years old (47.56%); in terms of household size, the difference is very small between households with three people (44.16%) and those with four people or more (43.83%).

Measures and Scale Tests

The Likert five-point scale ranges from 1 ("strongly disagree") to ("strongly agree") and is used to measure reference dependence (RD), normative internalization (NI), symbolic expectations (SE) and RFWBs, and network embeddedness (NE) in the moderating role. The questionnaire references dependence was adapted

from Vermeer et al. [63]. The questionnaire measuring pressures from outside, following social norms was adapted from Kumar et al.[64] 's "Subjective Norms" scale. Adapted scale questions from Axsen et al. [65] on interpersonal influence and hedonic value were used to measure symbolic expectations. According to Zheng et al. [66], network embeddedness can be measured by questions on the frequency of interaction and trusting relationships. In addition, considering that individual food waste behavior can be influenced by demographic variables, gender, age, education, household size, and monthly per capita household income is considered and controlled for in this paper as variables that may have an extra-systematic effect on food waste behavior. The measurement questionnaire is shown in Table 1.

Data Analysis Methods

Detection of Main Effects

Based on the above hypotheses, in this survey study, gender, age, education, and household size were the control variables (Control), reference dependence (RD), normative internalization (NI), and symbolic expectations (SE) were the independent variables, network embeddedness (NE) was measured through the relational embeddedness and structural embeddedness dimensions, and reduced food waste behaviors (RFWBs) were the dependent variables. The main effects between the independent and dependent variables were tested using the least squares assessment model of the linear regression model, as shown in Equation (1):
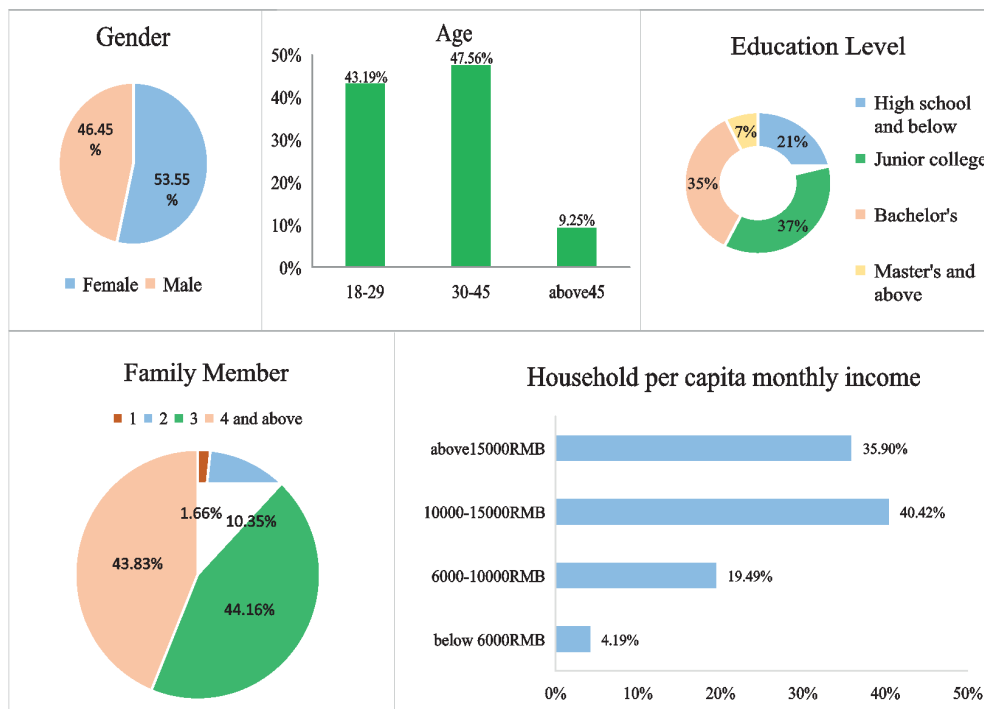

Fig. 3. The demographic information.

Table 1. Questionnaire.

Dimensions	Items
Demographic variables	Gender (female =0; Male =1)
	Age (18-29 years old; 30-35 years old; above 45 years old)
	Education (High school and below; Junior college; Bachelor's; Master's and above)
	Family Member (1 person; 2 people; 3 people; 4 people and above)
	Household per capita monthly income (below 6000RMB; 6000-10000RMB; 10000-15000RMB; above 15000RMB)
	Please select the most suitable item according to your actual situation: 1-->5 means strongly disagree --> Agree very much with
Reference dependence (RD)	1. When you dine, you order according to the number of people who are dining
	2. You won't increase your order just because the next table orders more food
	3. When friends and relatives (e.g., relatives, colleagues, classmates, leaders, friends) practice food saving, you will change your own food wasting behavior
Normative internalization (NI)	4. You agree with the idea of saving food and always practice saving behavior
	5. The amount of food you order is often constrained by the social concept of saving
	6. The extent to which you waste food is influenced by the frugal behavior of your friends and relatives (relatives, colleagues, classmates, leaders, friends)
Symbolic expectations (SE)	7. When you are at a multi-person dinner party, you think the amount of food you order will directly affect your reputation or interpersonal relationships
	8. You believe that excessive food can satisfy your physical or psychological pleasure
	9. You often buy more food to get rid of low moods
Network embeddedness (NE)	10. You think you can trust the food information provided by most people
	11. You think that contacting people from different fields will enable you to get more food information
	12. You buy food through information on food resources provided by friends and relatives (e.g., relatives, colleagues, classmates, leaders, friends)
	13. You spend a lot of time communicating with friends and relatives (e.g., relatives, colleagues, classmates, leaders, friends) on food consumption issues

$$RFWBsi = \alpha 10 + \alpha 11 RDi + \alpha 12 NIi + \alpha 13 SEi + \alpha 14 \sum Controli + \varepsilon 1i \quad (1)$$

Where i denotes the ith respondent and RFWBs, RD, NI, and SE denote food waste reduction behavior, reference dependence, normative internalization, and symbolic expectations, respectively. Control indicates the control variables, including gender, age, education, and household size. $\varepsilon 1i$ is the error term.

Detection of Moderating Effects

The interaction items of symbolic expectations and network embeddedness were used to test the moderating effect of network embeddedness on the relationship between symbolic expectations and REWBs. According to Feng et al. [67], Equation (2) was used to quantitatively verify the moderating effect of the network embeddedness.

$$RFWBsi = \alpha 20 + \alpha 21 RDi + \alpha 22 NEi + \alpha 23 SEi$$
$$NEi + \alpha 24 \sum Controli + \varepsilon 2i \quad (2)$$

Note: The variables in (2) are the same as in (1).

Results and Discussion

Reliability and Validity Check

The reliability of the variables in the questionnaire scale was tested using SPSS, and the results showed that Cronbach's α values of the variables were all above 0.7 (Table 2), the AVE of each dimension was greater than 0.5 and the CR values were all greater than 0.7. This suggests that the overall reliability and convergent validity of the questionnaire were good, the data were

Table 2. Reliability Analysis.

Reliability Analysis			
Variables	Cronbach's α	AVE	CR
Reference Dependence	0.744	0.478	0.783
Norm Internalization	0.710	0.504	0.670
Symbolic Expectations	0.801	0.599	0.817
Network Embeddedness	0.773	0.436	0.755

Table 3. Regression results of Reference dependence, Normative internalization and Symbolic expectations factors on the RWFBs.

Variables	Unstandardized Coefficient	Standard Error	T
RD[1]	0.178***	0.032	4.367
NI[2]	0.293***	0.027	6.857
SE[3]	0.227***	0.013	5.107
GE[4]	-0.065**	0.011	-2.570
AG[5]	0.035	0.013	1.115
ED[6]	-0.036	0.012	-0.772
FM[7]	-0.082***	0.020	-3.283
MI[8]	-0.060***	0.017	-2.725
R[2]	0.423		
Adj-R[2]	0.479		
F	417.2		

[1]RD: reference dependence; [2]NI: normative internalization; [3]SE: symbolic expectations; [4]GE: gender; [5]AG: age; [6]ED: educational level; [7]FM: family member; [8]MI: household per capita monthly income. *** and ** represent $p<1\%$ and $p<5\%$, respectively.

Table 4. The moderating role of network embeddedness.

Variables	Unstandardized Coefficient	Standard Error	T
RD[1]	0.154***	0.032	4.026
NI[2]	0.272***	0.033	5.17
SE[3]	0.255***	0.021	4.806
RD*NE[4]	0.065***	0.017	3.407
NI*NE[5]	0.038***	0.025	3.02
SE*NE[6]	0.045***	0.017	3.363
GE[7]	-0.043***	0.012	-2.988
AG[8]	-0.02	0.028	-1.149
ED[9]	0.047	0.019	1.034
FM[10]	-0.058***	0.013	-3.032
MI[11]	-0.040***	0.017	-2.916
R[2]	0.572		
Adj-R[2]	0.583		
F	569.2		

[1]RD: reference dependence; [2]NI: normative internalization; [3]SE: symbolic expectations; [4]RD*NE: reference dependence*network embeddedness; [5]NI*NE: normative internalization*network embeddedness; [6]SE*NE: symbolic expectations*network embeddedness; [7]GE: gender; [8]AG: age; [9]ED: educational level; [10]FM: family member; [11]MI: household per capita monthly income. *** and ** represent $p<1\%$ and $p<5\%$, respectively.

reliable, and each observed variable reflected well its corresponding to each latent variable. SPSS was used to conduct exploratory factor analysis to verify the structural validity: the KMO value of the sample data was 0.928, and the p-value of Bartlett's spherical test was 0.000 (less than 0.001), which indicates that the data of this study are very suitable for extracting information (from the side reflecting the good validity).

Main Effect Analysis

Based on Equation (1) to verify the effects of reference dependence, normative internalization, and symbolic expectations on residents' food waste behavior, Stata 16 was applied to analyze the data. As shown in Table 3, the F-value of the regression model was 417.2, indicating that the model was significant overall. The R² was 0.423, indicating that the regression models had a good fit. The regression coefficients of ND, NI, and SE were significant, and according to the questionnaire design of the items, it showed that reference dependence and normative internalization had a positive effect on reducing RFWBs, and their regression coefficients were 0.178 and 0.293, respectively. Therefore, H1 and H2 are valid. In addition, the regression coefficient of symbolic expectations is 0.227, which has a positive effect on RFWBs. Therefore, H3 holds.

The study found that reference dependence was positively associated with the reduction of RFWBs. This suggests that reference dependence reflects well the loss aversion characteristics of residents, and following group norms reduces decision-making risks for residents. It is

advantageous for residents to do so. Therefore, when residents are in a group with a strong perception of reducing food waste, they are influenced by collective perceptions regarding food waste reduction. They make decisions based on group information while following established norms and minimizing deviations from the group. This was also confirmed by Yang et al. [68], who found that groups make decisions based on reference points that influence courier packaging waste recycling behavior.

Yin et al. [69] confirmed that under the influence of social norms, education and propaganda formed a network scale indirectly influencing the low-carbon consumption behavior of Chinese residents to some extent. In the case of food waste behavior, the internalization of norms triggers residents' concern about their social image and influences their cognitive level. It generates certain social pressure to comply with social notions of food conservation to avoid the unpredictable dangers they face by violating social norms, thus slowing down and eliminating food waste.

In addition, it was found that symbolic expectations have a positive effect on RFWBs. This suggests that focusing on the symbolic nature of consumer behavior is important for the study of consumer behavior. This has been confirmed by previous studies, such as

Islam et al. [70] showed that symbolic images are an important factor influencing consumers' food choices; D et al. [71] confirmed that symbolic value has a direct positive effect on the behavioral intentions of pure electric vehicle users in China. For food waste behavior, overconsumption of food increases the conspicuous value of social prestige and status on the interpersonal level of influence, while over-purchasing food allows residents to maintain positive emotions or get rid of negative emotions when they have mood swings. In other words, the symbolic expectations of food consumption positively affect RFWBs by influencing consumers' interpersonal influence and intrinsic self-worth.

Moderating Effect

The moderating effect of NE on RD, NI, SE and RFWBs was verified by testing the moderating effect according to Equation (2). The results are shown in Table 4. The results show that the moderating effect of NE on all three principal component factors is significant as follows, and the regression coefficient of reference dependence with RFWBs is 0.065 after adding the interaction terms to the model, which is significant at the 1% level. This indicates that network embeddedness positively moderates the association between reference dependence and RFWBS. The level of the interaction term between normative internalization and symbolic expectations and network embeddedness was similarly significant, indicating that network embeddedness positively moderated the association between normative internalization, symbolic expectations, and RFWBs. It follows that H4, H5, and H6 hold.

The empirical results of the main effects analysis and moderating effects test indicated that network embeddedness significantly moderated the relationship between reference dependence, normative internalization, and symbolic expectations with reduced RFWBs. The results of the present study are consistent with previous findings that social network interactions influence more people to adopt low-waste behaviors [72] and that knowledge sharing in social networks contributes to improved organizational performance [73]. Specifically, network embeddedness promotes the positive effect of reference dependence on reducing RFWBs. When residents' interaction intensity and trust in social networks increase, the more they identify with the group's concept of food waste reduction, the more their reliance on group norms increases, and to reduce differences from the group, residents will actively practice food waste reduction. In addition, network embeddedness promotes the positive effect of normative internalization on reducing RFWBs. Normative internalization can synergize with network embeddedness to further encourage individuals to participate in group food waste reduction and further enhance the effect of discouraging groups from wasting food. In addition, network embeddedness facilitated the positive effect of symbolic expectations on RFWBs.

The residents' attention to symbolic expectations was influenced by their network embeddedness, and information exchange facilitated intense interactions, enhanced mutual trust, and increased residents' influence in networks. This led to a greater focus on consuming food for its conspicuous value, hedonic value, and other values, ultimately promoting RFWBs.

Conclusions

Reducing the occurrence of food waste behaviors is essential for achieving sustainable lifestyles and the United Nations' Sustainable Development Goals, and discovering the factors influencing residents to produce food waste behaviors is essential for changing residents' activities and habits. In this study, the factors influencing food waste were investigated in depth and some important findings were obtained. First, reference dependence and normative internalization all have positive effects on reducing RFWBs. In particular, normative internalization has a more significant effect on reducing RFWBs than reference dependence. Second, symbolic expectations have a significant effect on promoting RFWBs. In addition, the moderating effects of network embeddedness on reference dependence, normative internalization, and symbolic expectations are all significant, with network embeddedness moderating the association between reference dependence and reducing RFWBs.

Combining the findings of this paper, the following policy recommendations are proposed. Firstly, the government should conduct comprehensive surveys at the grassroots level to gain a profound understanding of residents' interest preferences. It is crucial to effectively steer residents' awareness towards food waste risks and crises by appropriately regulating their reference points for food purchase or consumption. Moreover, enhancing the frequency of disseminating and educating on knowledge related to food waste enables residents to perceive the long-term benefits or effects and foster a sense of policy acceptance. Secondly, the government can assign food waste reduction behaviors to symbolic expectations specific to the guiding policy and highlight the demand for additional utility such as prestige and hedonic value needed by the new policy to meet the target group, which will help the policy response and enhance the effectiveness of policy implementation. Thirdly, the government can establish professional "downstream" interaction platforms, such as encouraging communities and neighborhoods to establish social platforms. Trust and the accuracy of interactive information within the target group can be further improved by establishing network relationships among the target group while allowing residents to give feedback on the truth of the information and setting up special service channels to further ensure the accuracy of information transfer between target groups and the strength of the relationships formed by residents.

Acknowledgments

Conflict of Interest

The authors declare no conflict of interest.

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