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# Psychological Welfare Loss of Land-Expropriated Farmers in China

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Mandatory land expropriation, resettlement and welfare loss of landless peasants have received increasing research attention. However, in most previous analyses, the loss of psychological welfare of landless farmers is often neglected, which may lead to biased land requisition compensation and resettlement programs and incomplete policy recommendations. This study attempts to use a three-dimensional framework of place attachment to analyze the causes of psychological welfare loss. China's land expropriation and centralized resettlement cut off the material and emotional ties between farmers and land. Farmers' dependence on land, or their dependence on land-dependent farming lifestyle, has been neglected in the process of land acquisition and resettlement, resulting in the loss of farmers' psychological welfare. Based on a comparative analysis of the existing methods, this paper chooses the contingent valuation method (CVM) to measure the loss of psychological welfare of landless peasants *via* monetization. The feasibility of the model has been tested at a small scale in nine cities. The results show that 1) farmers have strong place attachment on agricultural land, although centralized land expropriation and resettlement have neglected this dependence and caused psychological welfare losses to landless peasants; and 2) the loss of psychological welfare of landless peasants can be measured by the CVM and presented in monetary units. The monetization measurement method in this paper still has some shortcomings and its feasibility requires more empirical tests. However, as a rare monetization measurement study, this paper can direct academic and policy attention towards this psychological welfare loss.

**Keywords: place attachment, land expropriation, centralized resettlement, land expropriated farmers, psychological welfare loss, contingent valuation method (CVM)**

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## 1 INTRODUCTION

In recent decades, to meet the needs of urban construction, China has requisitioned a large amount of farmland, which has resulted in a large number of landless farmers (Lian et al., 2016). The welfare of farmers after land loss has always been the focus of scholarly research. Most welfare studies focus on whether compensation is sufficient to compensate for the loss of the material welfare of landless farmers (Li et al., 2015; Peng and Bai, 2016; Huang et al., 2017; Wang et al., 2017; Cao et al., 2018). However, land has always represented more than a simple means of production and livelihood for most farmers in China (Li et al., 2015). Even if the loss of material welfare of farmers is fully compensated *via* policy, the resettled landless farmers still face cultural, psychological and social networking losses due to the difference between the urban and rural dual structure in China (Hui et al., 2013). Research on the loss of psychological welfare of landless peasants has gradually increased, especially with regard to the satisfaction of peasants, and such work illustrates the

deteriorating psychological status of peasants (Liang, 2015; Liang and Cao, 2015; Liang and Zhu, 2015; Chen et al., 2016; Qian 2017; Cao and Zhang, 2018; Cheng et al., 2018). However, the causes and measurement of psychological welfare loss, especially monetization measurements, have not been fully discussed.

In view of this shortcoming, this paper aims to reveal the emotional loss of land-lost peasants in China in an attempt to explain the loss of psychological welfare of land-lost peasants with the concept of place attachment. After analyzing the merits and demerits of the existing psychological welfare measurement methods, a monetized psychological welfare loss measurement method is proposed to provide a reference for perfecting the land expropriation system and quantitatively evaluating the psychological welfare loss of landless peasants. The structure of this paper is as follows. The next section will review the relevant research on the psychological welfare of landless farmers. In the third part, we use the Scannell and Gifford (2010) tripartite organization framework to analyze the causes of psychological welfare loss of landless farmers. The fourth part focuses on the evaluation of various psychological welfare measurement methods and shows that the contingent valuation method (CVM) can measure the loss of psychological welfare of landless farmers. A pilot study to verify the feasibility of the measurement method is presented in **Section 5**. The importance and limitations of this study are discussed in **Section 6**, and the conclusions of this paper are presented in the final section.

## 2 LITERATURE REVIEW

Reviewing the relevant literature on the loss of psychological welfare of landless peasants shows that scholars mainly discuss it from three perspectives: sociology, psychology and economics. First, from a sociological point of view, scholars prefer the qualitative description of psychological welfare and mostly focus on the social adaptation of landless farmers, such as urban adaptation (He et al., 2017), social identity (Zhang and Tong, 2006; He and Xue, 2014; Bao et al., 2017), cultural adaptation. Zhang and Tong (2006) found that due to passive urbanization, most landless peasants' self-identities were imbalanced, which led to anxiety. Believes that the process of urban adaptation of landless farmers is also the process of cultural adaptation from a traditional farming culture to modern urban culture. Psychological estrangement and social barriers lead to inferiority and a sense of loss, anxiety and insecurity caused by the sudden loss of land, which results in a lack of self-confidence among landless farmers and a deviation in the identity of "new citizens". Research on the urban maladjustment of land-lost peasants shows that these peasants suffer from a loss of psychological welfare due to land expropriation (Wang et al., 2019; Xie, 2019; Zhou, 2020; Nanhthavong et al., 2021).

From a psychological point of view, the two most typical welfare concepts are based on hedonic and Eudaimonic schools (Ryan and Deci, 2001; Lent 2004), and from these two research orientations, subjective well-being and psychological well-being are derived. There are overlaps and differences between the two conceptual models (Cooke et al., 2016). Since welfare is largely subjective well-being and many studies on the welfare of landless farmers have select subjective evaluation indicators to evaluate welfare (Peng and Bai, 2016; Shi, 2016), we discuss subjective well-being in detail. According to Diener (1994), the measurement of subjective well-being includes three parts: life satisfaction, positive emotion and negative emotion. Scholars mostly study the subjective well-being and influencing factors of different groups, such as landless farmers, migrant workers, rural residents and migrants (Nielsen et al., 2010; Hu et al., 2014; Liang and Wang, 2014; Liang and Zhu, 2015; Berry and Hou, 2016; Xia et al., 2018; Wang et al., 2019). Liang and Zhu (2015) used a positive and negative emotional scale and life satisfaction scale to measure the subjective well-being of landless peasants in relatively developed cities. Moreover, the subjective well-being of most landless peasants was lower than the midpoint, and as their negative emotions increased, the subjective well-being would decrease. Wang et al. (2019) found that land expropriation increased the family income of landless farmers but reduced the personal well-being. Due to differences in the land system and economic environment, few studies have been performed on land-lost farmers in foreign countries. However, from the relevant literature, the study of involuntary resettlement has a strong reference value. In the Impoverishment Risks and Reconstruction (IRR) Model (Cernea, 1997), involuntary immigrants face eight displacement risks. Obviously, landless farmers also face these risks, especially landless, unemployed and homeless farmers. Land-lost peasants face involuntary immigration in a sense. The government's land expropriation behavior leads to the involuntary loss of land by rural residents, who are forced to relocate to urban centralized resettlement communities. Many scholars at home and abroad have verified the negative impact of involuntary migration on subjective well-being, even if resettlement improves the material welfare of forced migrants (Hwang et al., 2011; Day, 2013; Kaida and Miah, 2015; Herath et al., 2017; Vanclay, 2017). These studies reflect the fact that the subjective well-being of peasants is reduced and their psychological welfare is damaged after they are separated from their land. However, the measurement of subjective well-being has always been biased towards the self-report scale (Pavot and Diener, 1993), which is vulnerable to subjective factors, such as memory bias, attitude tendency etc. Moreover, subjectivity is observed in the evaluation of psychological welfare loss.

From the perspective of economics, especially welfare economics, most of the literature has focused on the welfare changes of landless peasants as shown in **Table 1**. Using Amartya Sen's functioning and capabilities welfare theory and taking economic conditions, social security, living conditions, living environment, psychological status and social participation as the welfare evaluation indicators, the welfare changes of land-expropriated farmers after land expropriation were measured from different perspectives (Li et al., 2015; Peng and Bai, 2016; Ding et al., 2017). Many studies used the fuzzy comprehensive evaluation method to confirm that the welfare level of land-lost farmers decreases after land expropriation. Only a few studies have shown that the overall welfare level of landless peasants has improved slightly, although the overall level is still at a low level.

**TABLE 1 |** Summary of the literature on welfare changes of landless farmers from the perspective of welfare economics.

| Author | Indicator Composition and Result* | Overall Welfare Level* | Specific measuring indicators of Psychological dimension* | Monetization measure |
|---|---|---|---|---|
| Nie et al. (2008) | Social security [mixed results]<br>Family income and expenditure ↓<br>Living environment [mixed results]<br>Psychology↓<br>Application rights↓ | ↓ | Psychological identity | No |
| Gao et al. (2010) | Economic situation↓<br>Social security↓<br>Living conditions↑<br>Community life↓<br>Environment↓<br>Psychology↓ | ↓ | Economic satisfaction | No |
| Gao and Qiao (2011) | Economic situation↓<br>Social security↓<br>Living conditions↑<br>Community life↓<br>Environment↓<br>Psychology↓ | ↓ | Affection between husband and wife | No |
| | Economic situation↓<br>Living conditions↑<br>Social security↑<br>Environment↓<br>Development space↑<br>Psychological status↓ | ↑ | City attribution<br>Interpersonal relations | No |
| | Economic situation↓<br>Living conditions↑<br>Community environment↓<br>Social security↓<br>Psychological factor↓ | ↓ | Residential comfort<br>Economic satisfaction<br>Entertainment satisfaction<br>Life satisfaction<br>Emotional satisfaction | No |
| Cai and Yuan (2012) | Economic situation↓<br>Social security↑<br>Living conditions↑<br>Landscape environment↑<br>Psychological factor↓ | ↑ | Degree of emotional loss | No |
| Cai and Zhu (2013) | Economic situation<br>Social security<br>Living conditions<br>Environmental conditions<br>Psychological factors | -- | Degree of emotional loss | No |
| Li et al. (2015) | Economic conditions↑<br>Dwelling conditions↑<br>Community surroundings↑<br>Social security↓<br>Psychological conditions ↓ | ↑ | Domestic relations,<br>Living pressure<br>A sense of achievement | No |
| Peng and Bai (2016) | Economic conditions↓<br>Social security↑<br>Development opportunities [mixed results]<br>Housing conditions↑<br>Living environment↓<br>Social communication with leisure [mixed results]<br>Health↓<br>Social participation↓ | ↓ | -- | No |
| Shi (2016) | Economic status↓<br>Social security↑<br>Living conditions↑<br>Social environment↑<br>Natural environment↓ | ↓ | -- | No |
| Gao and Qiao (2016) | Economic conditions↓<br>Protective protection↑<br>Housing conditions↑<br>Community Life↑<br>Psychological Feeling↓ | ↑ | Land ccompensation satisfaction<br>Life pressure<br>Quality of life<br>Willingness to be expropriated | No |
| Ding et al. (2017) | Economic conditions [mixed results]<br>Social Security↑ | mixed results | -- | No |

(Continued on following page)

**TABLE 1 |** (*Continued*) Summary of the literature on welfare changes of landless farmers from the perspective of welfare economics.

| Author | Indicator Composition and Result* | Overall Welfare Level* | Specific measuring indicators of Psychological dimension* | Monetization measure |
|---|---|---|---|---|
| | Social Opportunities↑<br>Living Conditions↑<br>Living conditions $^{\text{mixed results}}$ | | | |

*↑ *means ascending,* ↓ *means descending, mixed results means ascending and descending measurement results.*

Such welfare improvements are mainly due to the improvement of living conditions; however, the psychological status of landless peasants was deteriorated in the study (Cai and Yuan, 2012; Li et al., 2015). Through the construction of the fuzzy evaluation system of the welfare status of land-lost farmers, the welfare changes before and after land expropriation were measured and a quantitative analysis was performed. However, certain problems remain (Bao et al., 2018). In these studies, farmers' psychological well-being represents an integral part of the evaluation system and is difficult to differentiate; thus, it cannot be assessed separately. Moreover, the welfare indicators and calculation methods used by different scholars vary, which increases the difficulty of comparing the welfare levels calculated by different studies and does not provide an accurate picture of the welfare losses of landless farmers.

In summary, although scholars have studied the psychological welfare of landless peasants from different disciplines and provided qualitative descriptions and performed quantitative exploration, they have not further analyzed the underlying causes. The subjectivity of psychological welfare makes its measurement subjective and ambiguous. Farmers' maladjustment, low happiness and deteriorated psychological status cannot be directly measured by these language descriptions, nor do they attract the attention of scholars, the public and policymakers. We hope to find a more appropriate measure, such as monetization, to accurately and intuitively measure the size of the loss. In this way, when generating compensation plans, policymakers can reasonably compensate landless farmers to make up for their psychological welfare losses.

# 3 LOSS OF PSYCHOLOGICAL WELFARE OF LANDLESS PEASANTS

## 3.1 Performance

Since 2000, the standards of compensation and resettlement for land expropriation have been greatly improved in most areas. Especially after the implementation of new socialist countryside construction, standardized centralized placement has become increasingly popular. The advantages of centralized resettlement in standardizing construction, land protection, unified gas supply and unified water supply are regarded by local governments as an important method of promoting urbanization and modernization and important indicators in the cadre of assessment systems in China. Overall, the living conditions of landless farmers have improved significantly (Li et al., 2015). However, even if the living conditions have been significantly improved, a large number of in-depth interviews and reports by scholars and social media on the centralized resettlement of landless peasants point out that centralized resettlement causes psychological welfare losses to landless peasants. Farmers who are forced to resettle spontaneously change their resettlement community space to the traditional rural life they are familiar with (Li et al., 2016). From countryside to city, the land is separated from the life of a peasant, and the social and geographic relationship of land is broken. The centralized resettlement of landless peasants leads to anxiety as they attempt to rebuild their living environment and reshape their traditional lifestyle, etiquette, custom culture and neighborhood relations. Land-lost peasants reclaim nearby wasteland, erect shacks for weddings, funerals, and other ceremonies, abandon the use of natural gas and reburn firewood (Li et al., 2016; Guo et al., 2017; Lv and Pan, 2018). Other studies have pointed out that the mental health of landless farmers is worrying. The deteriorated mental state and behaviors associated with environmental renovation lead to the infringement on the rights of others, thus indicating that the psychological welfare of these peasants has suffered a loss.

In recent years, the problem of land-lost peasants reclaiming public green space privately in centralized resettlement communities has been repeatedly reported by the Chinese media. We searched Baidu (www.baidu.com) using the keyword "land-lost peasants + green land reclamation" and obtained nearly 1,400 relevant news reports, some of which are listed in **Table 2**. Most of the studies on the unsuitability of landless peasants in China also mention this phenomenon. Therefore, this paper argues that cultivating public green space is a typical manifestation of the damaged psychological welfare of farmers displaced from their land. By occupying public land, landless peasants try to rebuild their farming living environment and then restore their emotional relationship with farmland. However, this type of rebuilding behavior is often in conflict with the local government's management system of centralized resettlement communities. Managers often believe that such actions destroy the public environment and infringe on public power (Li et al., 2016; Lv and Pan, 2018). Therefore, managers often have disputes with farmers.

## 3.2 Explanation of Causes

Many scholars have attempted to eliminate the prejudice towards "uncivilized and low-quality landless peasants" and understand the motivation behind such behavior from social or cultural dimensions. However, the relevant research generally focuses on the perspective of "people" to explore how the

**TABLE 2 |** Report on green land reclamation by landless farmers in centralized resettlement areas.

| Source of news | Location | Headline | Time |
|---|---|---|---|
| Chengdu Business | Chengdu | Using green land as vegetable land will be banned if it is not rectified | 2012.10.9 |
| Hangzhou Local Treasure | Hangzhou | Unauthorized digging of green land will be fined | 2013.07.10 |
| NetEase News | Guangzhou | Green space for vegetable planting? Clean! | 2015.12.09 |
| People's Network | Shanghai | "Farmland" to "Garden" Resident Autonomy Leads to the "Rebirth" of Green Space in Residential Areas | 2015.12.17 |
| Sohu News | Tianjin | Green vegetable planting destroys clean environments | 2016.06.09 |
| Hainan Daily | Haikou | Drying clothes on trees and planting vegetables in green areas.Punished! | 2016.10.12 |
| Sohu News | Wuhan | Disputes over vegetable planting in public green spaces in the inactive communities of elderly residents | 2016.10.17 |
| Wuxi Media Network | Wuxi | Urban Management Maintaining the Residential Environment and Cleaning Up Vegetable Planting Violations in Residential Areas | 2017.04.07 |
| Sohu News | Wuhan | Jiangxia people unexpectedly dig green space to grow vegetables | 2017.07.01 |
| China Community Online | Xinjiang | Twenty-three Community Renovation Communities with Private Occupation of Public Greenland Vegetable Planting Phenomenon | 2017.07.03 |
| Qianjiang evening news | Hangzhou | Green land will be leveled and reverted to green soon after it is illegally converted into vegetable land | 2017.11.24 |
| North News | Hohhot | If planting vegetables in public green space. Remove! | 2018.05.26 |
| Tongliang Net | Chongqing | Regulate the Behavior of Planting Vegetables in Greenland | 2018.06.13 |
| Qilu Evening News | Jinan | Jinan legislates for civilization. Public green space vegetable planting and other acts will be heavily punished | 2018.11.22 |
| Yinchuan Evening News | Yinchuan | Community enclosures and green spaces are turning into private vegetable garden | 2019.02.06 |
| CCTV Network | Jinan | The 1,500 square meters vegetable field in Kuangshan District that occupied public green space and planted vegetable trees was cleared up | 2019.03.20 |
| Yunnan Network Radio and Television Station | Kunming | The green spaces of the community are enclosed to grow vegetables | 2019.05.02 |
| Jiamusi News Broadcast | Jiamusi | Residents suffer terribly from the change of green space into vegetable gardens | 2019.05.22 |

characteristics of the vulnerable group of landless farmers affect their behavior (Bao et al., 2017) while ignoring the perspective of human-land interactions (He et al., 2017). The human-land relationship is an important perspective for understanding human land-related behavior, especially irrational behavior. One of the popular interdisciplinary theories is "place attachment", which refers to the emotional bond between individuals and special places (Scannell and Gifford, 2010). Place attachment has been widely studied based on different people, farmers, the elderly, immigrants, and refugees as well as different places, motherlands, towns, neighborhoods, communities, farmland or even football fields (Lewicka, 2011). Site dependence also has a wide range of impacts on individuals who range from psychological, nostalgic, stressful, distrustful, fearful, and satisfied to behavioral issues, such as regression, recovery and reconstruction; moreover, they can manifest as constructive environmental concerns for land and forest protection and revisiting to destructive ideas, such as land use conflicts, development protests or resettlement resistance (Lewicka, 2011). Site dependence is an important concept in explaining certain land use behaviors, such as agricultural permanence (Hinojosa et al., 2016), landscape protection (Walker and Ryan, 2008), and conservation (Gosling and Williams, 2010). In China, place attachment is used to explain neighborhood participation (Zhu and Fu, 2017; Lu et al., 2018), environmental attitudes (Cheung and Hui, 2018), migration return (Du, 2017) and tourist destinations (Xu and Zhang, 2016). Compared with the all-embracing concept of place attachment, land attachment is a narrower concept based on place attachment, and it focuses on the emotional relationship between landless farmers and farmland. Despite the increasing importance of place attachment in explaining people's land-related behaviors and emotions, few studies have focused on landless farmers in China; thus, the current work presents a certain degree of novelty.

Specifically, we use the Scannell and Gifford (2010) three-dimensional organization framework of people, processes and locations to analyze the land dependence of landless farmers and explain the loss of psychological welfare of landless farmers (**Figure 1**).

The first element is people. The population of landless peasants in China is heterogeneous. Over the past 2 decades, a large number of farmers, mainly young people and men, have migrated seasonally from rural areas to urban areas for work. However, a large number of farmers, especially the elderly, still make a living *via* traditional agriculture. After land expropriation and centralized resettlement, the former will move to the city seasonally again and only the latter will live in the resettlement community full-time. These lifelong farmers have two important characteristics: farming and older age. Farmers have long been regarded as highly dependent on land (Cheshire et al., 2013; Hinojosa et al., 2016; Baldwin et al., 2017). Although there are few studies on the land dependence of Chinese peasants, topophilia is a common phenomenon in Chinese literary works with the theme of peasants and rural areas. Age is also thought to increase place attachment (McHugh and Mings, 1996; Rollero and De Piccoli, 2010). These elderly peasants acquired almost all of their knowledge from the land and devoted their lives to the land. Because of their attachment to farmland and agriculture, many farmers still engage in agricultural activities after retirement, which not only allows them harvest agricultural products but also to satisfy their life value (Grubbström and Eriksson, 2018).

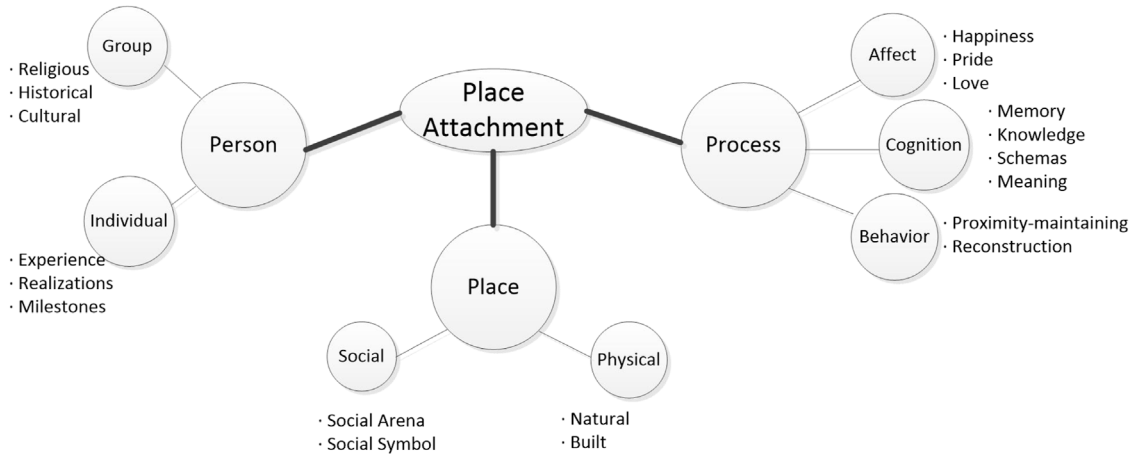


**FIGURE 1 |** Three-dimensional model of place dependency (proposed by Scannell and Gifford).

Land has multiple functions in the life of Chinese peasants. Mainly, land can provide farmers with livelihoods that are not affected by inflation. China's formal urban and rural security system is incomplete, and land can be understood as having a social security function (Cai and Zhang, 2006; Chen et al., 2009; Ho, 2014). Land is also an important social arena for farmers. Farming is the best time for farmers to socialize with their neighbors because they can show others what they are growing and share advice, which can greatly expand the farmers' communities. Farmers can maintain friendships *via* mutual assistance and exchanges with their neighbors. Good crops win praise from others. All of these factors have greatly contributed to the formation of farmers' social identities. In material terms, farming is not only the work of these elderly farmers but also their only exercise and recreation because they seldom have other sports or entertainment enjoyed by urban residents.

The last factor is the psychological process, which constructs the relationship between farmers and land through emotion, cognition and behavior. Local dependence is based on emotions as evidenced by the literature on involuntary immigration. Residents who are forced to leave their homes never cease their attachment to their old homes. In contrast, attachment will continue to rise, and they will mourn for their lost homes and places for many years, especially if they have not adapted to their new homes (Boğaç, 2009). Involuntary relocation can lead to the destruction of place attachment, and only when the dependence is destroyed will the people associated with the place actually realize their place attachment (Brown and Perkins, 1992). Involuntary relocation is often sudden, and these sudden changes may be overwhelming for those who have strong place attachment (Brown and Perkins, 1992), resulting in mental health problems such as sadness, anxiety and depression (Schweitzer et al., 2011; Richardson et al., 2016), which results in the loss of psychological well-being. Kaida and Miah (2015) indicated that the subjective well-being of rural-urban migrants is lower than that of urban resettlers while local attachment is higher than that of urban residents. The relocated landless peasants' emotional attachment to land is consistent with involuntary immigration. Baldwin et al. (2017) argued that cognitive attachment is enhanced by learning and reflecting on the production dynamics of the environment and landscape. According to media reports, peasants who cultivate green land are nearly 60 years of age or older. These peasants have basically taken farming as their only occupation since childhood and have been living with farmland for a long time, constantly strengthening their memory of farmland and constantly learning farming production knowledge. Long-term farming experience has made farmers feel strongly about land (Li et al., 2016). Farmers are associated with land because land represents who they are. Finally, place attachment is manifested by behavior, including proximity-maintaining behavior. For example, in a case study of involuntary migrants in the Three Gorges Project, Li and Rees (2000) found that most of the migrants who lost their land preferred to settle near their homes because they still used previous farming techniques and management experience to produce agricultural products in familiar land environments. Another type of behavior is the reconstruction of place. Site dependence is not static, and processes, time expenditure, site size, ownership status, and sudden changes are considered to affect dependency (Lewicka, 2011). If people cannot make changes in their environment to support their desired identity and goals, dependency will be undermined (Brown and Perkins, 1992). When people are dependent on leaving places (large change of state and small change of community) and experience various psychological injuries, they will adopt various ways of "self-treatment", such as consuming typical food commodities from their hometown, listening to music from their hometown (Cai and Liu, 2013; Wang et al., 2018), or rebuilding the environment of their hometown (Scannell and Gifford, 2010), such as decorate the garden and house into a familiar scene (Mazumdar and Mazumdar, 2012; Li et al., 2016). This kind of "reconstruction" or treatment is very close to the green land reclamation behavior of land-lost peasants, although the former is a legitimate act in private space while the latter is a violation of public space.

The theory of place attachment can better explain the "green land reclamation behavior" of landless peasants: compulsory land expropriation suddenly cuts off the relationship between peasants and cultivated land as well as the farming habits formed by the dependence on cultivated land, thus resulting in a strong land dependence of peasants and consequently a loss of psychological welfare. The centralized resettlement model fails to take into account such psychological loss (Kaida and Miah, 2015) and fails to leave open space for farmers. Therefore, farmers occupy public space and try to restore the human-land relationship by rebuilding their farming environments. Furthermore, policymakers should consider this loss and take action to compensate for it as much as possible, provided that it can be measured.

# 4 MEASUREMENT OF PSYCHOLOGICAL WELFARE LOSS

## 4.1 Method Selection

Welfare is a concept with a wide range of connotations. Economists of different stages and schools have different views of welfare and equate welfare with utility, preference and well-being. Therefore, many welfare measurement methods have been developed based on different disciplines and different welfare theories. Pigou (1929) holds that a person's welfare is implied in his satisfaction, which can be attributed not only to the possession of property but also to other factors (such as knowledge, emotion, desire, etc.). Such attribution leads to measurable benefits with broad implications. Thus, Pigou's research is limited to the narrow sense of welfare that can be measured directly or indirectly *via* money, i.e., economic welfare. However, scholars have carried out in-depth studies from the perspective of sociology and psychology, such as subjective well-being, psychological well-being and quality of life studies. Regards welfare as mental or psychological welfare, which is mainly measured by subjective evaluations and defined as psychological welfare. Many types of psychological welfare measurement methods have been developed.

The first method is self-reporting from a psychological perspective. Well-being has four conceptual branches in psychology: subjective well-being, psychological well-being, quality of life, and wellness (Cooke et al., 2016). After decades of development, scholars have hardly reached a consensus on the concept and measurement of psychological well-being. Based on different research perspectives, they have developed many measuring tools with obvious differences, such as from a single dimension to multiple dimensions. The main measuring method is the self-reporting method, in which data from respondents are mainly collected *via* questionnaires and quantitative information is obtained *via* rating scales. This method has the advantages of a simple explanation, abundant information, motivation reports and strong operability. However, this method also has fatal shortcomings. First, psychological welfare measurement results will differ because of the different scales used by scholars and changes in the item order; therefore, the results of different studies are difficult to compare. For example, Kaida and Miah (2015) used a satisfaction with life scale to measure subjective well-being; Liang and Zhu (2015) also used the life satisfaction scale and included a Positive and Negative Affect Schedule to measure subjective well-being; Nielsen et al. (2010) used an eleven-point Personal Well-Being Scale to measure subjective well-being; Xia et al. (2018) only used five-point; and Wang et al. (2019) used a single-dimensional scale to measure subjective well-being. Second, the validity of the measurement tools will also affect the measurement results. Finally, this measurement method is susceptible to subjective factors, such as memory bias and attitude tendency.

The second method includes welfare evaluation systems based on function and ability welfare theory. Sen (1993) regards welfare as a combination of welfare functions and welfare capabilities, considering not only material economic benefits but also potential viable benefits, and incorporating noneconomic benefits into the assessment. This theory focuses on individual freedom, makes up for the defect in which the former measurement only focuses on objects, and improves the accuracy of welfare measurement. A literature review showed that scholars who use this method to study the welfare of landless peasants regard psychological welfare as one of the dimensions and focus on qualitative descriptions of increases or decreases in the welfare of landless peasants. Moreover, Sen did not clearly define the criteria of viability, which led to inconsistency among welfare indicators selected by different scholars and differences in the calculation methods, which made it difficult to compare the welfare levels calculated by different studies and increased the difficulty of cross-regional comparisons.

The third method includes evaluations of resources and environment value. This method evaluates the economic value of resources and the environment by measuring people's preferences for environmental goods or services, which are usually identified based on monetary values. The monetary unit is the most suitable index for measuring the damages and benefits associated with resources and the environment. From a new welfare economics, the two terms economic value and welfare change can be used interchangeably. Therefore, we believe that the method of value assessment is feasible for measuring the loss of psychological welfare of landless farmers. In general, economic valuation methods can be divided into three categories: direct market valuation approaches, revealed preference approaches and stated preference approaches (Kumar, 2012; Damigos et al., 2016). Agricultural land is a combination of natural, economic, and social attributes, which present use value and nonuse value. Specifically, we have drawn a structural chart of farmland value and the evaluation method (**Figure 2**).

The above chart clearly shows that farmland value assessments can be divided into market value assessments and nonmarket value assessments. Direct market valuation approaches rely on production or cost data, which are not applicable if there is no market for the goods or services studied (Kumar, 2012). In our view, the loss of farmers' psychological welfare caused by the elimination of land dependence belongs to the nonmarket value of farmland because there is no market price. We tend to choose the latter two evaluation methods. Among them, the travel cost

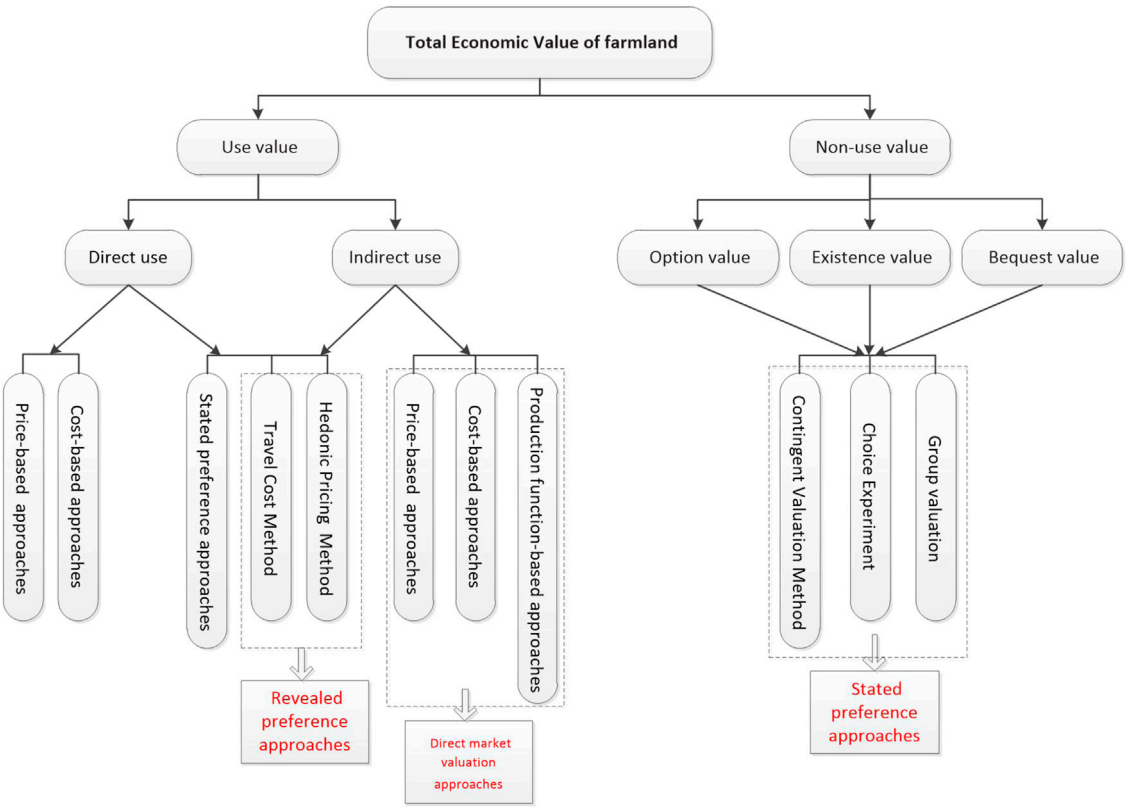


**FIGURE 2 |** Structural chart of the farmland value and evaluation method.

method (TCM), the hedonic pricing method (HPM) and the CVM are three classical nonmarket value assessment methods. After a comparative analysis, we choose the CVM method because it is more suitable for this study. The specific analysis of the above methods is described as follows.

The HPM is a special regression technology to study the relationship between heterogeneous commodity characteristics and commodity prices. In the aspect of farmland value evaluation, the HPM determines farmland value by analyzing the relationship between marginal changes in the farmland characteristics and real estate price, and its hypothesis is that the property price is related to the characteristic attributes of farmland. Imperfections in the market and policy failures will affect monetary value estimates of farmland (Kumar, 2012); therefore, the HPM is more widely used in developed countries with perfect market economy systems.

The TCM method is mainly used to evaluate the recreational value of scenic spots and environments with landscape function. As far as farmland is concerned, scholars mostly focus on the study of farmland landscapes (Fleischer and Tsur, 2000; Cai et al., 2008; Huang and Wang, 2015; Qiu and Fan, 2016). Revealed preference approaches (TCM and HPM) are ex-post valuation methods based on real market transactions, and although their measurement results are more reliable, they depend on actual or observed behavior and cannot estimate nonuse value (Kumar, 2012; Damigos et al., 2016).

The CVM method can assess use value and nonuse value and is more suitable for ex-ante evaluations (Kumar, 2012). In welfare economics, CVM is used to measure individual preferences without market prices. Scholars measure individual preferences for the environment or ecological facilities and investigate the effects of dependence on these preferences (Lee et al., 2013; López-Mosquera and Sánchez, 2013; Keske and Mayer, 2014; Nielsen-Pincus et al., 2017). In fact, many scholars have used CVM to evaluate the use value and nonuse value of agricultural land resources (Bowker and Didychuk 1994; Cai and Zhang, 2007; Cai et al., 2008; Jin et al., 2013; Huang and Wang, 2015; Bani and Damnyag, 2017), and it is also used to assess welfare changes (Knetsch, 2010; Rakotonarivo et al., 2018). CVM uses two methods to construct contingent schemes: willingness to pay (WTP) and willingness to accept (WTA). Therefore, we select CVM to monetize the loss of psychological welfare of landless farmers. According to Hicksian welfare theory, the values of WTP and WTA are theoretically equal (Horowitz and McConnell, 2002); therefore, each method can be used to investigate the welfare losses of the respondents. Discussions on the differences and comparative advantages between WTP and WTA continue in practice (Kim et al., 2015). Considering the possibility of overestimating the WTA (Knetsch, 2010; Soguel and Silberstein, 2015), this paper adopts the more commonly used WTP.

## 4.2 Measurement Process

In the previous analysis, we show that Chinese farmers, especially elderly farmers, have a strong dependence on their farmland, although land expropriation and centralized resettlement have completely cut off their relationship with their farmland. The resulting loss of psychological well-being is manifested in many aspects, and although it is a well thought out, loss and other psychological conditions suitable for the use of the master scale are difficult to measure by monetization. In contrast, the scope and monetization of public green space are typical parameters that are easy to monetize. Therefore, our measurement chooses to assess the contingent value of green space occupancy and how much these farmers are willing to pay for the legal period required to balance their psychological welfare losses. It should be emphasized that the term "payment" in the WTP does not imply any value judgment for all welfare rights. Based on the NOAA CVM Survey Design Principles, we accurately designed the survey questions for this study on the basis of group discussions and predictive surveys. Compared with the bilateral dichotomy, in the guidance mode of the WTP, guidance technology is more effective than the single boundary (Calia and Strazzera, 2000; Freeman et al., 2014). This study used the bilateral boundary model to investigate the respondents' WTP for their agricultural land.

The DBDC-CVM model does not directly query the respondents' WTP but rather estimates the WTP by constructing a functional relationship between the bidding value and respondents' response probability, and it then measures psychological welfare losses. Specifically, we divide this model into five steps (**Figure 3**).

a) Assume scenarios. The core issues are shown in **Figure 3**.
b) WTP boot. The survey team provided the respondents with two consecutive bid values. The second bid value depends on the answer to the first bid value. The initial tender value and the range of tender amount are determined through pre-investigation. Respondents expressed the amount of WTP randomly given by the survey team by answering "yes" or "no". If the first bid value (T) is accepted (Y), then the higher bid value (TH) is provided; however, if (T) is rejected (N), the lower bid value (TL) is provided. The guidance process is also shown in **Figure 2**.
c) WTP formula derivation. The respondents' answers ultimately had four possible outcomes: Y-Y, Y-N, N-Y, and N-N. The response probability of each result can be calculated using a stochastic utility model (McFadden 1973):

$$\begin{aligned} P_1 &= P_{YY} = 1 - G(T^H) \\ P_2 &= P_{YN} = G(T^H) - G(T) \\ P_3 &= P_{NY} = G(T) - G(T^L) \\ P_4 &= P_{NN} = G(T^L) \end{aligned} \tag{1}$$

where G (·) is the cumulative distribution function (CDF).

$$G(T^i) = \frac{1}{1 + (\alpha + cT^i + \sum_k \beta_k X_k)} \tag{2}$$

The above equation includes the constant item, the bid value coefficient, the K explanatory variable and the corresponding explanatory variable coefficients.

When the WTP is greater than or equal to 0, according to Hanemann (1984), the average WTP of bilateral boundary dichotomy can be obtained by following mathematical expectations:

$$\begin{aligned} E(WTP) &= \int_0^{T^{MAX}} \frac{dt}{1 + exp(-\alpha - \beta\bar{X} - cT)} \\ &= \frac{1}{\alpha} ln \frac{e^{\alpha + \sum_{i=1}^{n} \beta_i \overline{x_i} + cT^{MAX}}}{1 + e^{\alpha + \sum_{i=1}^{n} \beta_i \overline{x_i}}} \end{aligned} \tag{3}$$

In the above equation, the regression coefficients of constant items, bid values, average values of variables affecting respondents' WTP, and explanatory variables (except the bid values) are the regression coefficients.

d) Construction of Multinomial Logit Model (MNL). Among the many econometric methods used to explore the influencing factors of WTP, the Multinomial Logit Model is widely used (Balogh et al., 2016; Yaylali et al., 2016). For the disordered response variable f = 1,2,.. F, we have the MNL model:

$$Ln\left[\frac{P(y = f|x)}{P(y = F|x)}\right] = a_n + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n \tag{4}$$

In our study, there are four reaction combinations: Y-Y, Y-N, N-Y, and N-N. N-N was selected as the reference group; thus, we have the following:

$$\text{Model 1: } Ln\left[\frac{P_1}{P_4}\right] = a_1 + c_1 T + \beta_{11} x_1 + \beta_{12} x_2 + \ldots + \beta_{1n} x_n \tag{5}$$

$$\text{Model 2: } Ln\left[\frac{P_2}{P_4}\right] = a_2 + c_2 T + \beta_{21} x_1 + \beta_{22} x_2 + \ldots + \beta_{2n} x_n \tag{6}$$

$$\text{Model 3: } Ln\left[\frac{P_3}{P_4}\right] = a_3 + c_3 T + \beta_{31} x_1 + \beta_{32} x_2 + \ldots + \beta_{3n} x_n \tag{7}$$

Based on previous research and practical experience, factors that may affect the WTP, such as dependence, age, and gender, were selected. Second, a regression analysis was carried out on the MNL model of WTP and explanatory variables and K was calculated to explain the influence degree of different explanatory variables.

e) WTP estimation. WTP can be obtained by substituting the parameter estimation results into **formula (3)**.

# 5 FEASIBILITY STUDY OF THE MODEL

## 5.1 Pilot Study

To verify the feasibility of the DBDC-CVM model to measure the psychological welfare loss of landless peasants, the research team conducted an empirical study in nine cities, including Haikou, Wuhan

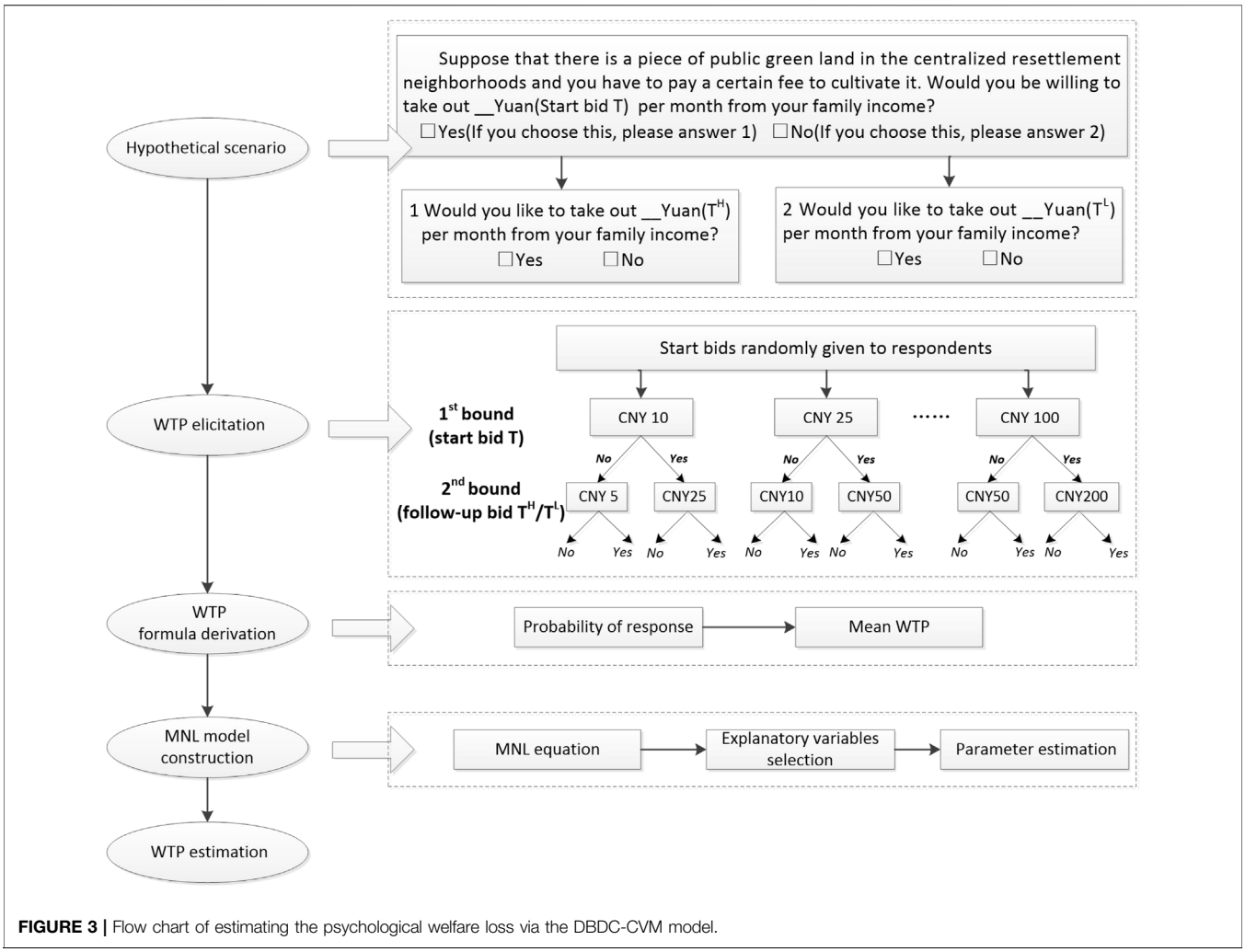


**FIGURE 3 |** Flow chart of estimating the psychological welfare loss via the DBDC-CVM model.

and Chengdu, during summer vacation from 2016 to 2018 (**Figure 4**). Among the cities, 200 questionnaires were distributed in Haikou, whereas the scale of the survey was reduced in the other cities due to time and cost problems. Eighty surveys were conducted. Due to space limitations, this paper only reports the situation and results of the Haikou survey in detail. In the past 30 years, Haikou has experienced rapid development and urbanization, which is similar to other provincial capitals in China. Haikou City is praised as the pioneer of land expropriation system reform in China's land management system and a model of standardized and centralized resettlement of landless farmers. The mass media in Haikou frequently reported the reclamation and cultivation of public green space. We select Liuzhen, Mayor of Haikou, and Lingshan Town, which each have more than 1,000 families, as two centralized resettlement communities and randomly surveyed 100 families.

In Haikou, 98 males and 102 females (SD = 0.501) had a uniform gender distribution. The participants' ages ranged from 36 to 45 years old ($p$ = 35%) and 46–55 years old ($p$ = 31%) with the youngest under 25 years old ($p$ = 4.5%). The educational level of the respondents was generally below junior middle school ($p$ = 80%), and the proportion of undergraduates and above was the smallest ($p$ = 4.5%). Half of the respondents were temporary workers after land expropriation. In addition, only 6.5% of the land-expropriated peasants have an annual income of more than 50,000 yuan (RMB, approximately 6.9 RMB for a dollar).

## 5.2 Empirical Results

### 5.2.1 Distribution of Payment Schemes

In the pre-investigation, we determined the initial tender value and the range of the tender amount, which are 5, 10, 25, 50, 100, and 200 yuan, and formed four payment schemes (10, 25, 5) (25, 50, 10) (50, 100, 25), and (100, 200, 50). According to the WTP guidance process, the response distribution of the respondents in the formal survey is shown in **Table 3**. In total, 167 respondents (83.5%) showed a willingness to pay, and most of them chose to pay a small price for land. The fourth plan, i.e., the maximum plan, was often rejected twice, partly because of the low income of landless farmers (the study inquired about the reasons for zero payment, trying to distinguish protest payment from "real zero" in order to reduce deviation). The results showed that after land expropriation and resettlement,

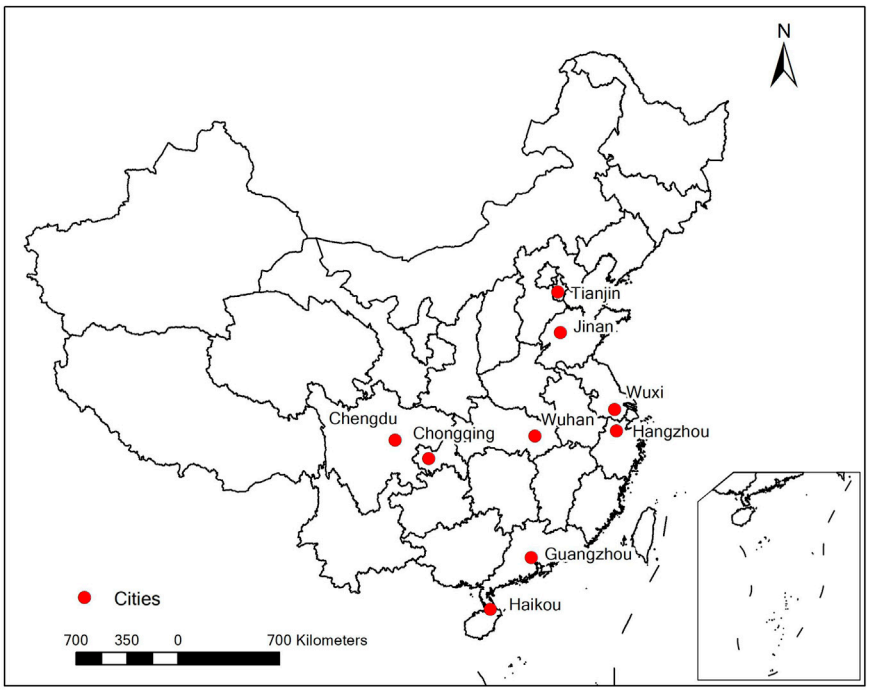


**FIGURE 4 |** Study area location.

**TABLE 3 |** Distribution of respondents' answers.

| Pay plan | Number and rate (%) | | | | |
|---|---|---|---|---|---|
| | Y-Y | Y-N | N-Y | N-N | Sum |
| 1. (10,25,5) | 35 (70) | 8 (16) | 4 (8) | 3 (6) | 50 (100) |
| 2. (25,50,10) | 10 (20) | 30 (60) | 6 (12) | 4 (8) | 50 (100) |
| 3. (50,100,25) | 10 (20) | 18 (36) | 14 (28) | 8 (16) | 50 (100) |
| 4. (100,200,50) | 0 (0) | 8 (16) | 24 (48) | 18 (36) | 50 (100) |

the connection with land has been cut off and psychological welfare losses are widespread.

### 5.2.2 Estimation Results of the DBDC-CVM Model

According to expert suggestions and previous studies (Bani and Damnyag 2017; Jin et al., 2018; Jin et al., 2019; Liu et al., 2019), the explanatory variables of the MNL include five social demographic variables: gender, age, and education level, annual family income and current work; and two psychological variables: land dependence and moral judgment. Breakdown (**Table 4**). This study used the four-point self-report scale of Hinojosa et al. (2016) and Soguel and Silberstein (2015), i.e., "Do you depend on your farmland", to measure the dependence of landless farmers on farmland. According to the Richter Four-Point Self-Report Scale, 20% of the respondents had a strong place attachment on farmland, and 40% of the respondents had a strong dependence on farmland. Only 2.5% of respondents said that they did not depend on farmland. The proportion of respondents in other cities who believed that there was a very strong and strong dependence on agricultural land was more than 50%. This result confirms the dependence of landless farmers on farmland.

The average result of the MNL (**Table 5**) is substituted into **Eq. 3**, and the WTP value is 51.62 yuan/month, approximately 600 yuan/year and 89.69 dollars/year. This value is the price paid by Haikou farmers who want to own arable land and then partially rebuild their farming habits. According to the previous analysis, we have reason to think that this result represents the psychological injury caused by the forced expropriation and centralized resettlement of peasants. Thus, this price can represent the loss of peasants' psychological welfare to a certain extent.

### 5.2.3 WTP in Other Research Areas

The loss of psychological welfare of landless peasants measured according to the survey results of nine cities is summarized in the lower column chart (**Figure 5**). The table shows that there are great differences in the loss of peasants' psychological welfare among cities. The highest loss of peasants' psychological welfare in Wuhan is 73.09 yuan per month, which is more than three times that in Chengdu, and the lowest loss of peasants' psychological welfare is 22.73 yuan per month. The average value of each city is 47.72 yuan per month, which is equivalent to 82.91 yuan per year.

## 6 CONCLUSION

Compulsory land expropriation not only cuts off the material and economic relations between expropriated peasants and the land

**TABLE 4 |** Variable definitions in the Multinomial Logit Model.

| Variable | Meaning | Value method |
|---|---|---|
| T | Bid value | Value in the pay plan |
| Sex | Sex | 1: Male; 0: Female |
| Age | Age | 1:≥56; 2:46–55; 3:36–45; 4:26–35; 5:≤25 |
| Edu | Education level | 1: No formal education; 2: Primary schools; 3: Junior schools; 4: High schools (secondary schools); 5: Junior College; 6: Undergraduate and above |
| Inc. | Annual income of the family (CNY) | 1:≤10,000; 2:10,000–20,000; 3:20,000–30,000; 4: 30,000–50,000; 5: 50,000–100,000; 6: Above 100,000 |
| Job | Current Job | 1: None; 2: Temporary worker; 3: Stall-keeper; 4: Public servants |
| PA | Attachment to the farmland | 1: Very strong; 2: Strong; 3: Average; 4: No |
| MJ | Is enclosure and tillage of the public green land an uncivilized behavior | 1: Totally not; 2: Not; 3: No judgement; 4: Yes; 5: Totally yes |

**TABLE 5 |** Parameter estimation results of the Multinomial Logit Model in HaiKou.

| | (1) | (2) | (3) |
|---|---|---|---|
| | YY/NN | YN/NN | NY/NN |
| C | 18.5011*** | 13.1173*** | 8.8044*** |
| | (0.0000) | (0.0000) | (0.0030) |
| T | −0.0089** | −0.0007* | 0.0105** |
| | (0.0400) | (0.0823) | (0.0402) |
| Sex | −0.1369 | −0.6063 | −0.1557 |
| | (0.8906) | (0.4561) | (0.8384) |
| Age | −0.0661*** | 0.1219*** | 0.4956*** |
| | (0.0001) | (0.0000) | (0.0005) |
| Edu | −0.1658*** | 0.1990*** | −0.1523*** |
| | (0.0074) | (0.0083) | (0.0484) |
| Job | −3.3581*** | −1.7142*** | −1.0777*** |
| | (0.0000) | (0.0057) | (0.0438) |
| Inc. | 0.0953 | 0.0508 | −0.0193 |
| | (0.8484) | (0.6122) | (0.1046) |
| PA | 8.6712*** | 4.8921*** | 3.5428*** |
| | (0.0000) | (0.0000) | (0.0018) |
| MJ | −0.8365 | −1.1570** | −0.5528 |
| | (0.1719) | (0.0183) | (0.2133) |
| Obs | 200 | | |
| Pseudo $R^2$ | 0.4897 | | |
| LR Test | 263.74*** | | |

*, **, and *** represent significance at the 10, 5, and 1% levels, respectively.*

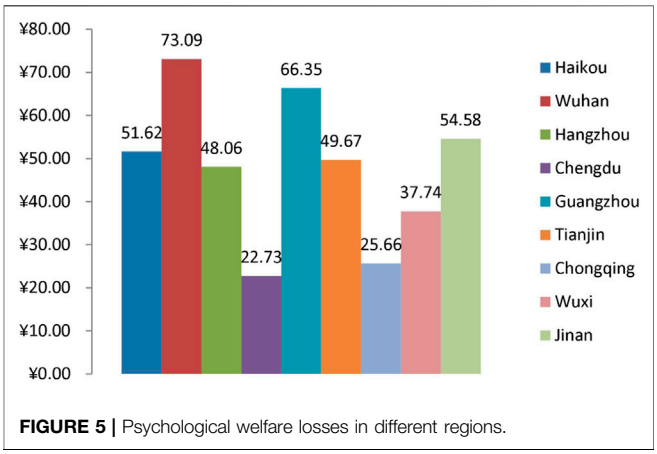


**FIGURE 5 |** Psychological welfare losses in different regions.

but also cuts off the strong emotional relationship between the expropriated peasants and the land and farming habits they developed in the long-term farming process. This dependence hinders the rapid integration of these farmers into urban life, resulting in the loss of their psychological well-being. A common behavior of farmers after centralized resettlement is to reclaim public green space as vegetable fields, which also occurs because vegetables can be planted to reduce the cost of living. Interdisciplinary place attachment theory provides us with a new perspective for understanding this behavior. The theory of place attachment points out that some people will try to restore the human-land relationship by rebuilding the environment of their original place. Farmers' behavior of reclaiming green space can also be understood as their attempt to reconstruct the farming living environment at a small scale and alleviate the psychological welfare losses caused by land expropriation and centralized resettlement.

Compared with most studies on the extent of psychological loss reported by self-rating scales, we used the CVM method to monetize the loss based on farmers' reconstructing environmental behavior. Empirical studies on different scales of nine cities, such as Haikou, have proved the feasibility of our model and the value of further application of this model in other cities in China. We measured the average psychological welfare loss of the respondents in nine cities at approximately $82.91 per year. Although this value is not surprising, it is not small for landless farmers. Our research has confirmed that compulsory land expropriation and centralized resettlement have resulted in the loss of psychological welfare of land-expropriated farmers to a certain extent. Policymakers and researchers should pay more attention in terms of policy and academic research to this loss, especially to further optimize the placement strategy to improve the material welfare of land-expropriated farmers as well as their spiritual welfare through participatory community planning.

## 7 DISCUSSION

Abundant evidence shows that frequent compulsory land expropriation and centralized resettlement in China have dramatically changed the material and psychological welfare of

landless farmers. Most of the literature focuses on the debate about whether the material welfare of farmers is getting worse or better, although research on changes in farmers' psychological welfare is also increasing. An increasing number of researchers has realized that cultivated land is not only a means of production and an important asset for farmers but also a "basic element" of farmers' life. There are intangible but key emotional attachments between farmers and land that affect their sense of place after migration (voluntary or involuntary) and their identity after urbanization (Qian and Zhu, 2014).

The phenomenon of transforming public green space into vegetable land has been reported frequently after land-expropriated peasants settle in centralized resettlement communities. Contrary to the view that this type of behavior is caused by the low quality and uncivilized behavior of peasants, some studies believe that it is based on the peasants' inadaptability to urbanization. Based on the interdisciplinary "place attachment" theory, our study interprets this behavior as follows: after mandatory land expropriation cuts off the relationship between farmers and cultivated land and based on the farming lifestyle of cultivated land, farmers have strong land dependence and attempt to rebuild their original living environment in their new community in green spaces. The land use of such spaces is transformed to arable land to restore the human-land relationship. The widespread observation of this type of behavior indicates that Chinese peasants have suffered psychological welfare losses due to land expropriation. We further believe that this loss of psychological well-being can be approximately monetized by the farmers' willingness to pay for the legitimacy of rebuilding activities (green land to arable land). We constructed a DBDC-CVM model and conducted empirical studies on different scales of land-expropriated farmers' centralized resettlement communities in nine cities, such as Haikou. The survey proved the rationality of our explanation from two aspects. The first is the self-reports on land dependence from the questionnaire. The respondents in nine cities think that the proportion of people who have very strong or strong dependence on land is more than 50%. Second, according to the questionnaire, farmers have an obvious willingness to pay for the cultivation of green space, and the price ranges from 22.73 yuan per month to 73.09 yuan per month.

The results of different cities are quite different. On the one hand, the differences may be because of regional differences. On the other hand, the differences may be because of our empirical investigation, which was limited by time and funds and small in scale. However, the purpose of our research is not to accurately measure the loss of psychological welfare of land-expropriated peasants in cities or in China as a whole but rather to show that land-expropriated peasants do have a willingness to pay for the cultivation of public green space. Thus, restoring the relationship between people and land and explaining that the loss of psychological welfare of peasants should be prioritized in the process of land expropriation. Although differences in prices occurred, the average price is 47.74 yuan per month, which represents considerable wealth for farmers. The minimum standard of old-age insurance for landless farmers in many areas is only 260 yuan per month, which further illustrates the strong willingness of farmers to rebuild their farming environment and restore human-land ties.

Our model measures the farmers' willingness to rebuild farming environment, which is only part of the loss of psychological welfare caused by land expropriation, a typical explicit form. Farmers also suffer from dissatisfaction, depression and subhealth caused by land expropriation (Zhang and Tong, 2006; Richardson et al., 2016). These unobserved losses have not been measured in our model but represent a future research goal. If these problems are further studied, the monetized value of psychological welfare losses caused by forced land expropriation may increase significantly. Of course, the farmers' reclaiming public green space is not only because of the loss of psychological welfare but also because of the reduction of food expenditures. Although we have stated that the hypothesis of the CVM survey was only the willingness to pay for a very small public green space and asked the respondents not to consider the value of vegetable production, the loss of psychological welfare may have been overestimated because willingness to pay includes economic value.

There is some controversy in monetizing nonmarket values or loss by the CVM or other methods (Venkatachalam, 2004), even if we adopt the more advanced bilateral boundary dichotomy method and model and measure it strictly according to the methodology. However, this attempt also has its unique advantages. Monetization can more easily arouse the attention of policymakers, researchers and other groups about the importance of issues associated with expropriation (Jin et al., 2013; Liu et al., 2019). Farmers' material welfare may be improved by considering issues associated with land expropriation and centralized resettlement, such as housing, transportation, drinking water, garbage disposal, etc. However, policymakers should further determine whether farmers are satisfied with their new life and whether nonmaterial requirements are met. Although our study focused on a monetized measure, our point of view is not to provide monetary compensation for these psychological welfare losses. In contrast, we believe that the needs of farmers should be more respected in the design and planning of communities rather than transferred to the values and aesthetics of external designers.

It is worthwhile to further optimize our measurement model and conduct a larger empirical survey, although such work will be expensive. However, such work can more accurately measure the loss of farmers' psychological well-being and provide for further analyses of why the loss of farmers' psychological well-being in different regions is quite different. Such differences may be related to the level of regional economic development, urbanization, and urban level; the prevalence of farming culture; the level and mode of government compensation and resettlement, etc. In addition, individual differences are also worth considering because farmers' gender, education level, age and income may affect their degree of psychological welfare loss. The relationship between certain factors and psychological welfare loss is reflected in **Table 5**, although this paper does not extend this analysis. Further research on individual differences can help policymakers formulate more

differentiated and targeted resettlement programs so that farmers in a more disadvantaged positions can receive more help.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

## ETHICS STATEMENT

Ethics review and approval/written informed consent was not required as per local legislation and institutional requirements.

## AUTHOR CONTRIBUTIONS

Conceptualization, LX.; methodology, LQ and QL.; validation, LW and ZH; writing—original draft preparation, FX;

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