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Valuing cultivated land protection: A contingent valuation and choice experiment study in China

Jin Jianjun*, He Rui, Wang Wenyu, Gong Haozhou

Faculty of Geographical Sciences, Beijing Normal University, Beijing, China

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ABSTRACT

This study is to examine the public's preferences for cultivated land protection in Wenling City of China using a dichotomous choice contingent valuation method (CVM) and a choice experiment method. An empirical comparison of the welfare measures derived from the CVM and CE was conducted. We found that the valid response rate of the CVM was higher than that of the CE, while the CE data produced a higher percentage share of supporting votes for cultivated land protection than the CVM data. The estimation results show that the mean willingness to pay from the CVM is larger than that obtained from the CE, but they are not significantly different. Our results indicate that carefully designed CVM and CE were suitable to value cultivated land protection in China. The study results can contribute to the literature on comparing the willingness to pay estimates derived from the CVM and CE and can help improve our current understandings of local public's preferences for cultivated land protection.

1. Introduction

Cultivated land is a critical resource that is indispensable to the survival and development of human beings (Liang et al., 2015). In China, the cultivated area is nearly 1.35 million km^2, accounting for approximately 13% of the national land area (Zhao et al., 2016). It plays a key and strategic role in achieving sustainable development and enhancing the food security of the country (Deng et al., 2015). However, with China's rapid economic development and urban expansion, the substantial loss of cultivated land since the 1980s has become a serious concern of the public and policymakers (Zhang et al., 2014).

Statistics have indicated that a total of approximately 222,000 ha of cultivated land was lost in China between 2009 and 2014 (National Bureau of Statistics of China, 2015). Many studies have been conducted to explore the causes of cultivated land loss and the contributing factors. Lichtenberg and Ding (2008) assessed the influence of China's farmland protection policy and concluded that China does not effectively protect its farmland. Early studies have shown that one fundamental reason for China's poor protection of cultivated land is the insignificant value of agriculture relative to other land uses (Bergstrom and Ready, 2009; Cai et al., 2006; Jin et al., 2013a; Ma and Zhang, 2014). In fact, cultivated land can generate social benefits that are not captured by ordinary markets (Johnston and Duke, 2007).

For public decision-making, the cost-benefit analysis (CBA) has appeared to be particularly promising because it is independent of the nature of relevant public policy, and it allows the establishment of simple decision rules (Arrow et al., 1996; Dachary-Bernard and Rambonilaza, 2012). From a strictly economic efficiency point of view, the CBA imposes that the calculation of the social benefit should be compared with the total cost. Thus, to design efficient policies concerning cultivated land protection, it is necessary for policymakers to find a measure for quantifying the benefit of cultivated land protection in monetary terms.

Since certain specific benefits that people derive from cultivated land protection are not fully reflected in the ordinary market, it is difficult to measure the total benefits of cultivated land protection in a typical economic analysis. Stated preference (SP) methods can create hypothetical markets to elicit people's willingness to pay (WTP) for changes in non-market goods to establish the benefits (Bateman et al., 2002). The contingent valuation method (CVM) and choice experiment (CE) are two primary means of SP methods (Carson and Louviere, 2011).

The CVM appeared as the first methodological response for non-market valuation and has become one of the most commonly used methodologies to value non-market goods in the economic literature (Carson et al., 2003). Although the CVM is widely used, it has a number of limitations (Foster and Mourato, 2003; Dachary-Bernard and Rambonilaza, 2012). For example, the CVM is not suitable in situations where multiple options and attributes are being considered (Stevens et al., 2000). For this reason, there is a need to go beyond to promote

* Corresponding author.
E-mail address: jjjin@bnu.edu.cn (J. Jin).

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other valuation methods. The CE is a new non-market valuation technique for establishing the importance of a different 'attribute' in the provision of a good as well as a marginal rate of substitution among these attributes (Adamowicz et al., 1994). The inclusion of cost as an argument in the discrete choice experiment permits estimation of welfare changes from one scenario to another (Adamowicz et al., 1998).

As noted by Hanley et al. (1998), the CVM and CE share a common theoretical framework in the random utility model (Hanemann, 1984) and a common basis of empirical analysis in dependent variable econometrics (Hanley et al., 2001). Research comparing the CVM and CE has received more attention. The main objective in comparison tests is to examine the welfare estimates between the summation strategy as developed in the CE and the simultaneous valuation of the CVM (Dachary-Bernard and Rambonilaza, 2012). However, presently, there are actually few studies that compare the WTP estimates derived from the CVM and CE. Early examples include the research of Boxall et al. (1996, on recreational moose hunting in Canada), Adamowicz et al. (1998, on preserving caribou habitat in Alberta), Hanley et al. (1998, on environmentally sensitive areas in Scotland), Jin et al. (2006, on solid waste management program in Macao), Colombo et al. (2006, on soil conservation policy in Spain), Christie and Azevedo (2009, on water quality improvement in the US) and Gómez et al. (2014 on technology adoption in Chile). In the literature, no consensus exists concerning the comparability of the CVM and CE results (Lehtonen & et al., 2003). For example, Hanley et al. (1998) found that the CE values are larger than those obtained from the CVM, but they are not significantly different. Foster and Mourato (2003) found that the CE gives significantly larger results than the CVM for the more inclusive public good and significantly smaller results for the less inclusive public good.

To fully evaluate the differences between the CVM and CE, as Boxall et al. (1996) had suggested, more empirical studies comparing the CVM and CE should be explored for different goods and services to fully evaluate the differences between CVM and CE. To the best of our knowledge, the CVM and CE have never been compared with respect to cultivated land protection, especially in developing countries. Given the importance of cultivated land protection for the sustainable development of China, the comparison of the welfare estimation results of cultivated land protection derived from the two methods may offer some interesting findings. In this respect, the objective of this study is to compare the estimates of the WTP measures of cultivated land protection obtained using the CVM and CE in Wenling City, China. The application of the two methods highlights how they can be used to inform the decision-making process. Moreover, the findings of this study can add to the literature on comparing the CVM and CE estimates in the field of cultivated land protection.

2. Materials and methods

2.1. Study area

Wenling City is located on the southeast coast of Zhejiang Province where the most notable feature of rural development has been the loss and degradation of cultivated land (Skinner et al., 2001). The total area of Wenling is approximately 920 km^2. The population density of Wenling City is approximately 1288 inhabitants per square kilometer (Statistics and Census Bureau of Wenling City, 2015). It is one of the most densely populated counties in China.

In the last two decades, Wenling has experienced rapid economic growth because of the increasing rate of urbanization and industrialization. Cultivated land was thus relocated from agricultural to nonagricultural uses. The survey results of Land-Use Change in Wenling showed that the total area of available cultivated land in Wenling in 2009 was 4500 ha (13%) less than in 1996 (Jin et al., 2013b). The continued loss and degradation of cultivated land have prompted concerns regarding the sustainable development and rural planning of the City. Local government officials indicated the importance of cultivated land protection for land-use planning. To develop effective protection policies, it is important for them to know the social benefits of cultivated land protection.

2.2. Survey instrument

The survey instrument was carefully designed based on several focus group discussions and pre-test surveys. The draft questionnaire was thoroughly discussed with various groups of government officials in charge of cultivated land protection and management in Wenling City, experts on land use and management, and local residents. By means of the focus groups, we identified the best subset of cultivated land protection effects to be used as attributes. Then, the revised version of the survey was pre-tested on 100 local residents in Wenling City (40 for the CE version and 60 for the CVM version). The main purpose of this pilot survey was to evaluate the wording, extension and other survey design issues. After some corrections based on the pilot survey results, the final version of the survey was determined.

The final version of the questionnaire was structured in three sections. The first section formulated some questions on the respondents' knowledge about the benefits of cultivated land protection and their attitudes towards cultivated land protection. The second section contained the valuation scenario, the proper contingent valuation questions or the choice experiments. The respondents were first presented with a brief description of the current status regarding the cultivated land protection in Wenling City. The contingent choices/market about improved hypothetical cultivated land protection programs and the payment methods were then introduced. The last portion of the questionnaire collected some socioeconomic data regarding the respondents and their households. To avoid biasing WTP estimates and to achieve consistency, both the CVM and CE used identical formats and questions except for the valuation questions.

In the CV method, the respondents were asked to evaluate a new and improved cultivated land protection program, which mainly aims at protecting the quality and quantity of cultivated land in Wenling. Respondents were asked to indicate whether their household would voluntarily contribute to implement the program for a period of ten years. A single-bounded dichotomous question was used, which is considered to be incentive compatible (Carson and Groves, 2007). A vector of five prices was chosen for the implementation of the dichotomous choice format. Each individual randomly received one of these five bids (5, 10, 20, 40, and 60 CNY, 1 US$ approximately = 6.80 CNY) established based on the results of pilot surveys.

In the CE, the respondents were asked to choose the most preferred option from three alternatives. One was the status quo with no improvements in cultivated land protection, at no cost. The other two alternatives were improved protection programs featuring combinations of attribute levels and specific cost levels (Table 1). The attributes included were landscape, land fertility, land facility and cost, which are the same as in the CVM. The payment instrument was a household voluntary contribution for a period of ten years. We used a D-optimality

Table 1
Attributes and attribute levels in CE.

Attribute	Description	Levels
Landscape	The values of cultivated land protection.	No change, better amenity
Facility	The government will take some measures to improve land field facilities such as road and water irrigation system.	No change, better facility
Fertility	The government will take some measures to improve land fertility.	No change, better fertility
Cost	The cost for the household if the alternative was chosen (CNY/household/month).	0, 10, 30, 60

Table 2
A sample choice set in CE surveys.

Attribute	Option A	Option B	Option C
Landscape	No change	Better amenity	Better amenity
Land facility	No change	No change	Better facility
Land fertility	No change	Better fertility	Better fertility
Cost(CNY/household/month)	0	10	30
I would choose option A ☐			
I would choose option B ☐			
I would choose option C ☐			

criterion to optimize the experimental design (Scarpa and Rose, 2008). In total, 21 versions of choice sets were finally constructed from the design, and they were divided into 3 blocks based on the principle of level balance and minimal overlap. An example choice set is provided in Table 2. Visual aids in a color booklet were used to help the respondents to understand each attribute and its levels.

2.3. Data collection

To obtain a representative sample, we used the stratified random sampling method to select the sample based on the parameters of population, age and gender published in the local census statistics. The unit of the survey was household rather than individual. The respondents for our survey were household heads who are the person in charge of the daily expenditures and other family members. In case of absence of the head of the household, the questions would be directed to the next household member, older than 18 years, living on the premises.

Personal interviews were conducted to encourage more responses. This survey method is expensive, but it can provide the highest response rates and is better suited to collecting complex information (Khan and Damalas, 2015). The interviewers involved were carefully trained to conduct face-to-face interviews in an effective way.

3. Results and discussion

In total, 466 surveys were successfully completed from June to August 2012. Among these, 220 were for the CVM and 246 for the CE. After censoring for inconsistent and missing answers, 206 (94%) were valid for further examination for the CVM, which is higher than the valid response rate of the CE (89%, n = 219). This may be because the large number of choice tasks in a CE questionnaire places greater demand on the respondents, and they may tire of repeated choice tasks and lose interest (Lehtonen et al., 2003). Among the 220 CVM respondents, 101 respondents (approximately 49%) were prepared to pay for the improved cultivated land protection program by saying ‘yes’ to the WTP question. Among the total 219 valid answers in CE, 88 respondents (40%) displayed zero WTP in their CE responses by always choosing the status quo option for all seven choice sets. This result shows that the CE data produced a higher percentage share of supporting votes for improved protection than the CVM data. One likely reason for this is that the respondents who completed the CE questionnaire did not have to choose the most expensive protection program, but they were still able to express their support for improved protection (Johannesson et al., 1999).

3.1. Socioeconomic characteristics of respondents

The descriptive statistics of the main socioeconomic characteristics of the interviewed respondents are reported in Table 3. In the CVM, the number of male respondents was a bit larger than that of female respondents, whereas in the CE, the number of household heads was nearly even between female and male respondents. We found that 34% had completed a high school degree (approximately 11 years of education) in the CVM and 31% in the CE. The mean household size was approximately 3.04 in the CVM and 3.38 in the CE. The average household income was approximately 76,900 CNY/year (11308 US$/year) and 77,900 CNY/year (11456 US$/year) for the respondents in CVM and CE, respectively.

A paired sample *t*-test for differences in the mean values of the socioeconomic variables of the CVM sample and the CE sample showed that there were no significant differences between the two groups. In comparison with the Wenling official statistics, the results showed that our sample corresponds well or quite well with regards to gender, household size and household income. Thus, it can be concluded that our sample may be considered representative.

3.2. Attitudes of respondents to cultivated land protection

The respondents reported that the most serious problem associated with cultivated land protection in Wenling was the conversion of cultivated land for non-agricultural purposes. Approximately 50% of the respondents stated that the government should assume responsibility for cultivated land protection. Approximately 40% of the sample agreed that everyone should protect cultivated land resources for future generations, showing an apparent bequest motive for cultivated land protection.

The respondents were presented with some statements regarding six external benefits of cultivated land protection (water and soil conservation, air purification and climate regulation, wildlife habitat, national food security, esthetic values, and farmer employment) and were asked to state their agreement on a scale of 1 (strongly disagree) to 5 (strongly agree). The results showed that the local public in Wenling had some knowledge of several external benefits of cultivated land protection. For example, approximately two-third of the sample strongly agreed that ensuring national food security was an important benefit. More than 70% of the sample strongly agreed or agreed that cultivated land protection can yield the benefits of climate regulation and air purification, water and soil conservation and assurance of farmers’ employment.

3.3. Estimation results from the CVM

The dichotomous choice CVM has a binary choice dependent variable that requires a qualitative choice model. The probit and logit models are commonly used to model ‘yes’ or ‘no’ responses to relevant socioeconomic variables and other variables (Ninan and Sathyapalan, 2005). The logit model was used in this study because it is preferred to the probit model in many fields because of its relative computational simplicity (Lee, 1997).

In this study, the dependent variable in the logit model was the probability that the respondent would be willing to pay for the new cultivated land protection program. The explanatory variables included the bid amount, the respondents’ knowledge regarding cultivated land benefits, and certain demographic and socioeconomic variables. The results of the models are summarized in Table 4.

The estimation results showed that the variable Bid (price bids) has a negative and significant sign, implying that a higher bid amount would lower the probability of respondents’ supporting the cultivated land protection program. This finding is consistent with the economic demand theory. The other factors influencing the respondents’ WTP included the respondents’ Education, Donation, Knowledge, Urban and Income. The coefficients of Education (the respondent’s level of education) and Knowledge (the respondent’s knowledge regarding cultivated land protection) were positive and significant. These results indicated that a respondent with a greater knowledge level on cultivated land protection or a higher educational level would be more inclined to say ‘yes’ to the WTP question. As expected, Donation was positive and significant at the 1% level, suggesting that if the respondent was more active in social donation activities, she/he would have a higher WTP for

Table 3
Main socioeconomic variables of the respondents in CVM and CE.

Variables	Description	CVM	CE	Wenling population[a]
Gender	1 = male, 0 = female	0.56(0.50)	0.52(0.50)	0.51
Age	Age of respondents (1 = 18–39, 0 = 40-65)	42.16(11.02)	40.29(14.10)	–
Educate	Education of respondents (1 = above high school level, 0 = otherwise)	0.34(0.42)	0.31(0.46)	–
Hhsize	Household size	3.04(1.37)	3.38(1.49)	3.06
Income	Total yearly household income (1000 CNY)	76.9(64.1)	77.9(68.7)	78.1

Note: Standard deviations in parentheses. Number of respondents in CVM format: 206, and in CE format: 219.
[a] Statistics and Census Bureau of Wenling City (2015).

Table 4
Factors influencing respondents' WTP in CVM sub-sample.

Variables	Definitions	Coefficient	Std. Error
Constant	–	1.70***	0.45
Bid	The bid used	−0.04***	0.01
Education	Education of respondents (1 = high school or above, 0 = otherwise)	0.91**	0.42
Donation	Dummy variable, 1if respondents had attended donation activity; 0 otherwise	1.52***	0.40
Knowledge	Knowledge on cultivated land protection (good = 1, bad = 0)	0.91**	0.39
Urban	Dummy variable, 1 = urban citizens; 0 = otherwise	0.99*	0.39
Income	Total household income (1000CNY/year)	0.08**	0.04
Summary statistics			
Log likelihood		−94	
LR Chi^2 (6)		97.77	
Prob > Chi^2		0.0000	
Pseudo R^2		0.34	

* Significant at $p \le 0.1$.
** Significant at $p \le 0.05$.
*** Significant at $p \le 0.01$.

Table 5
Definitions of variables included in the logit model.

Variable	Descriptions
ASC1, ASC2	Alternative specific constant
Urban	Dummy variable,1 = urban respondents; 0 = otherwise
Young	Number of household members less than 12 years of age
Income	Total yearly household income (10^4 CNY)
Education	Education of respondents(1 = above high school level, 0 = otherwise)
Knowledge	Knowledge on cultivated land protection (1 = good, 0 = otherwise)

Table 6
The random parameter logit estimation results of CE.

Variables	Model 1		Model 2	
	Coefficients	Std. Error	Coefficients	Std. Error
Landscape	0.33***	0.12	0.27**	0.10
Facility	0.70***	0.14	0.59***	0.09
Fertility	0.55***	0.13	0.49***	0.09
Cost	−0.04**	0.02	−0.02***	0.06
ASC1	0.06	0.08	0.07	0.07
ASC2	0.65**	0.27	1.90***	0.16
Urban			0.71***	0.12
Young			0.21**	0.10
Income			0.07***	0.10
Education			0.88***	0.13
Knowledge			0.22**	0.11
Summary statistics				
Log-likelihood	−1582		−1516	
Chi-square	198		331	
(*p*-value)	0.000		0.000	
Observations	1531		1531	

** Significant at $p \le 0.05$.
*** Significant at $p \le 0.01$.

the new and improved land protection program. Urban was positive and highly significant, implying that urban respondents had a higher WTP for the new land protection program. Income had a positive and statistically significant impact on the respondents' WTP, suggesting that a household with a higher income would have a greater WTP for the new land protection program.

3.4. Estimation results from CE

In this study, the random parameter logit models were used to estimate the respondents' preferences for cultivated land protection. In the random parameter logit model, taste variation among individuals is explicitly treated (Train, 1998; Carlsson et al., 2003). We developed two models. The first model, model 1, is the basic specification model to demonstrate the importance of the choice attributes in explaining the respondent's preferences. In this model, utility is determined by the levels of four attributes (Landscape, Facility, Fertility, and Cost) in the choice sets. The second model, called model 2, considers a series of knowledge and socioeconomic variables in addition to the four attributes. The definitions of the explanatory variables used are shown in Table 5.

We estimated random parameter logit models with simulated maximum likelihood using Halton draws with 250 replications. The estimation results of these two models are shown in Table 6. The coefficients for all attributes have the expected signs and are statistically significant. The positive signs of the coefficients for the Landscape, Facility and Fertility indicate that an improvement of these attributes can increase the utility of respondents. The significantly negative coefficient on cost attribute denotes that a greater cost would lower the choice probability of a new protection program.

One knowledge variable and four socioeconomic variables (Income, Urban, Young, and Education) were included in model 2 by interactions with the alternative specific constant. The coefficient on Urban was positive and significant, suggesting that the urban respondents would choose the improved land protection program more frequently than the rural respondents. The Education variable was positive and significant, implying that more-educated respondents would have a higher preference for an improved land protection program. The Young variable coefficient was positive and significant, indicating that if the respondents have more young household members, they would more likely prefer an improved protection program. The variable of Knowledge was positive and significant, suggesting that the respondents with more knowledge regarding cultivated land protection would more frequently choose the improved land protection option. The positive and significant coefficient of Income supports the hypothesis that the wealthier respondents would be more likely to choose the improved and more costly protection program.

The marginal WTP for a change within a single attribute using a linear-in-parameters utility function can be represented as follows

Table 7
Marginal WTP for attributes in choice sets (US$/household/month).

Attributes	MWTP	95% confidence intervals
Landscape	1.33	0.22–1.43
Facility	3.14	1.12–5.16
Fertility	2.20	0.56–3.83

Table 8
WTP measures in CVM and CE (US$/household/month).

Methods	WTP	95% confidence intervals
CVM	6.25	1.93–10.56
CE	5.58	1.71–9.46

(Hanemann, 1984; Morrison et al., 1999):

$$MWTP = -\frac{\beta_{attribute}}{\beta_M}$$

where *MWTP* is the marginal willingness to pay; β_M is the marginal utility of income, represented by the coefficient for the monetary cost attribute. $\beta_{attribute}$ is the coefficient associated with the corresponding non-monetary attribute.

Using the above equation and the estimation results of model 1, the marginal WTPs for each non-monetary attribute in the choice sets are shown in Table 7. The 95% confidence intervals (CI) were obtained by using the delta method (Greene, 2000). The implicit prices for all of the attributes are positive, implying that the respondents have a positive WTP for an improvement in each attribute. The implicit prices can also be used to identify which attribute is more important to the respondents, which can be used by policymakers to assign more resources in favor of the attributes that have more implicit prices. The results showed that an increase in land facility produced the highest impact on the WTP for an improved cultivated land protection program. Land fertility had also a significant impact, but relatively less important, followed by Landscape.

3.5. A comparison of welfare measures from CVM and CE

Based on our design, the CVM only examined one policy change, where the suggested protection program has better amenity, better land facility and better land fertility, while the CE technique allows estimation of welfare impacts in different levels of the attributes. To compare welfare measures from each method, the CE is restricted to estimate the welfare impact of the same improvement offered in the CVM (Jin et al., 2006).

For the CE, welfare measures (WTP) relative to different scenarios can be obtained by using the following equation, where V^0 and V^1 represent the indirect observable utility before and after the change under consideration and β_M is the monetary attribute coefficient (Boxall et al., 1996; Morrison et al., 1999):

$$WTP = -\frac{1}{\beta_M}(V^0 - V^1)$$

Table 8 shows the mean WTPs derived from both the CVM and CE for the new cultivated land protection program. The results show that the mean WTP from the CVM is approximately 6.25 US$ per household per month. For the CE data, the monthly WTP of a typical household for the cultivated land protection program from the status quo to the greatest attribute level was calculated to be approximately 5.58 US$ by adding the WTP of each attribute. The results indicate that the mean WTP derived from the CVM is slightly higher than that derived from the CE. In Table 8, we note that the 95% confidence intervals of the mean WTP values from the CVM and the CE nearly overlap. It can be concluded that the mean WTP from the CVM and the mean WTP from CE are not significantly different (Duffield and Patterson, 1991; Loomis et al., 1997).

4. Conclusions

The rapid pace of economic development in Wenling City has raised concerns regarding cultivated land loss and the increasing need to protect cultivated land. To implement an optimal design of protection policy, policymakers need information regarding the public's preferences for policy intervention on cultivated land protection. Two stated preference methods are used, namely, choice experiment and contingent valuation, to obtain estimates of the public's preferences for cultivated land protection in Wenling City, China. The methods were administered to a random sample of 466 household heads (male or female) ranging in age between 18 and 65 years in Wenling.

The results from both the CVM and CE showed that local public in Wenling City had a positive WTP for cultivated land protection. The factors influencing the respondents' WTP for cultivated land protection include their knowledge regarding cultivated land protection, education attained and total household income, all with positive and significant effects.

A comparison between the resulting welfare measures determined using the CE and CVM shows that the mean WTP based on the CVM is larger than those obtained from the CE, but they are not significantly different. Our study also demonstrated several interesting differences between the CVM and CE. First, the CVM can directly estimate the economic values for a single cultivated land protection policy. In contrast, the CE approach allowed us to assign economic values to different attributes of protection measures that policymakers can fine-tune. Second, our results showed that the valid response rate of the CE is lower than that of the CVM. Finally, our findings showed that the CE data produced a higher percentage of supporting votes for the improved protection program than the CVM data. However, our objective is not to determine the superiority of one method over the other, but rather, to contribute to improving the reliability of the valuation procedure and to bring additional elements into the debate (Dachary-Bernard and Rambonilaza, 2012).

While there are few previous comparable studies using both methods in the field of cultivated land protection in developing countries, the results from this study do appear to be consistent with the economic theory. The results of this study allow us to conclude that a carefully designed dichotomous choice CV method and CE were suitable for evaluating the public's preferences for cultivated land protections in China.

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References

Adamowicz, W., Louviere, J., Williams, M., 1994. Combining revealed and stated preference methods for valuing environmental amenities. J. Environ. Econ. Manage. 26, 271–292.
Adamowicz, W., Boxall, P., Williams, M., Louviere, J., 1998. Stated preference approaches for measuring passive use values: choice experiments and contingent valuation. Am. J. Agric. Econ. 80, 64–75.
Arrow, K., Cropper, M., Eads, G., Hahn, R., Lave, L., Noll, R., Portney, P., Russell, M., Schmalensee, R., Smith, K., Stavins, R., 1996. Is there a role for benefit-cost analysis in environmental, health, and safety regulation? Science 272, 221–222.
Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D.W., Sugden, R., Swanson, J., 2002. Economic Valuation with Stated Preference Techniques: A Manual. Edward Elgar, Cheltenham, UK.
Bergstrom, J., Ready, R., 2009. What have we learned from over 20 years of farmland

amenity valuation research in North America? Rev. Agric. Econ. 1, 21–49.
Boxall, Peter C., Adamowicz, Wiktor L., Swait, Joffre, et al., 1996. A comparison of stated preference methods for environmental valuation. Ecol. Econ. 18, 243–253.
Cai, Y.Y., Li, X.Y., Zhang, A.L., 2006. The application of contingent value method in non-market value of cultivated land resource. Ecol. Econ. (Academic Edition) 2, 10–14 (in Chinese).
Carlsson, Fredrik, Frykblom, Peter, Liljenstolpe, Carolina, 2003. Valuing wetland attributes: an application of choice experiments. Ecol. Econ. 47, 95–103.
Carson, R.T., Groves, T., 2007. Incentive and informational properties of preference questions. Environ. Resour. Econ. 37 (1), 181–210.
Carson, Richard T., Louviere, Jordan J., 2011. A common nomenclature for stated preference elicitation approaches. Environ. Resour. Econ. 49, 539–559.
Carson, R., Mitchell, R., Hanemann, M., Kopp, R., Presser, S., Ruud, P., 2003. Contingent valuation and lost passive use: damages from the Exxon Valdez oil spill. Environ. Res. Econ. 25, 257–286.
Christie, M., Azevedo, C., 2009. Testing the consistency between standard contingent valuation, repeated contingent valuation and choice experiments. J. Agric. Econ. 60, 154–170.
Colombo, S., Calatrava-Requena, J., Hanley, N., 2006. Analysing the social benefits of soil conservation measures using stated preference methods. Ecol. Econ. 58, 850–861.
Dachary-Bernard, Jeanne, Rambonilaza, Tina, 2012. Choice experiment, multiple programmes contingent valuation and landscape preferences: how can we support the land use decision making process? Land Use Policy 29, 846–854.
Xiangzheng, Deng, Huang, Jikun, Rozelle, Scott, Zhang, Jipeng, Li, Zhihui, 2015. Impact of urbanization on cultivated land changes in China. Land Use Policy 45, 1–7.
Duffield, J., Patterson, D., 1991. Inference and optimal design for a welfare measure in dichotomous choice contingent valuation. Land Econ. 67 (2), 225–239.
Foster, V., Mourato, S., 2003. Elicitation format and sensitivity to scope. Environ. Resour. Econ. 24, 141–160.
Gómez, Walter, Salgado, Hugo, Vásquez, Felipe, Chávez, Carlos, 2014. Using stated preference methods to design cost-effective subsidy programs to induce technology adoption: an application to a stove program in southern Chile. J. Environ. Manage. 132, 346–357.
Greene, W.H., 2000. Econometric Analysis. Prentice Hall International, London.
Hanemann, M., 1984. Discrete choice models of consumer demand. Econometrica 52, 541–561.
Hanley, N., MacMillan, D., Wright, R., Bullock, C., Simpson, I., Parsisson, D., Crabtree, B., 1998. Contingent valuation versus choice experiments: estimating the benefits of environmentally sensitive areas in Scotland. J. Agric. Econ. 49, 1–15.
Hanley, N., Mourato, S., Wright, R., 2001. Choice modelling approaches: a superior alternative for environmental valuation? J. Econ. Surv. 15, 433–460.
Jin, J., Wang, Z., Ran, S., 2006. Comparison of contingent valuation and choice experiment in solid waste management programs in Macao. Ecol. Econ. 57, 430–441.
Jin, Jianjun, Chong, Jiang, Li, Lun, 2013a. The economic valuation of cultivated land protection: a contingent valuation study in Wenling City, China. Landsc. Urban Plan. 119, 158–164.
Jin, Jianjun, Chong, Jiang, Truong Dang, Thuy, Li, Lun, 2013b. Public preferences for cultivated land protection in Wenling City, China: a choice experiment study. Land Use Policy 30, 337–343.
Johannesson, M., Blomquist, G.C., Blumenschein, K., Johansson, P.-O., Liljas, B., O'Connor, B.M., 1999. Calibrating hypothetical willingness to pay responses. J. Risk Uncertain. 8, 21–32.
Johnston, R.J., Duke, J.M., 2007. Willingness to pay for agricultural land preservation and policy process attributes: does the method matter? Am. J. Agric. Econ. 89, 1098–1115.
Khan, M., Damalas, C.A., 2015. Farmers' willingness to pay for less health risks by pesticide use: a case study from the cotton belt of Punjab, Pakistan. Sci. Total Environ. 530–531, 297–303.
Lee, C.-K., 1997. Valuation of nature-based tourism resources using dichotomous choice contingent valuation method. Tourism Manage. 18 (8), 587–591.
Lehtonen, Emmi, Kuuluvainen, Jari, Pouta, Eija, Rekola, Mika, Li, Chuan-Zhong, 2003. Non-market benefits of forest conservation in southern Finland. Environ. Sci. Policy 6, 195–204.
Liang, Cheng, Jiang, Penghui, Chen, Wei, Li, Manchun, Wang, Liyan, Gong, Yuan, Pian, Yuzhe, Xia, Nan, Duan, Yuewei, Huang, Qiuhao, 2015. Farmland protection policies and rapid urbanization in China: a casestudy for Changzhou City. Land Use Policy 48, 552–566.
Lichtenberg, Erik, Ding, Chengri, 2008. Assessing farmland protection policy in China. Land Use Policy 25, 59–68.
Loomis, J., Brown, T., Lucero, B., Peterson, G., 1997. Evaluating the validity of the dichotomous choice question format in contingent valuation. Environ. Resour. Econ. 10, 109–123.
Ma, Aihui, Zhang, Jingjing, 2014. The use of choice experiments to value public preferences for cultivated land protection in China. J. Resour. Ecol. 5 (3), 263–271.
Morrison, Mark, Bennett, Jeff W., Blamey, Russell K., 1999. Valuing improved wetland quality using choice modeling. Water Resour. Res. 35 (9), 2805–2814.
National Bureau of Statistics of China, 2015. China Compendium of Statistics. China Statistics Press, Beijing (in Chinese).
Ninan, K.N., Sathyapalan, J., 2005. The economics of biodiversity conservation: a study of a coffee growing region in the Western Ghats of India. Ecol. Econ. 55, 61–72.
Scarpa, R., Rose, J.M., 2008. Design efficiency for non-market valuation with choice modeling: how to measure it, what to report and why. Aust. J. Agric. Resour. Econ. 52 (3), 253–282.
Skinner, M.W., Richard, G. k., Alun, E.J., 2001. Agricultural land protection in China: a case study of local governance in Zhejiang Province. Land Use Policy 18, 329–340.
Statistics and Census Bureau of Wenling City, 2015. Yearbook of Statistics. Wenling City Bureau of Statistics, Wenling (in Chinese).
Stevens, T.H., Belkner, R., Dennis, D., Kittredge, D., Willis, C., 2000. Comparison of contingent valuation and conjoint analysis in ecosystem management. Ecol. Econ. 32 (1), 63–74.
Train, K., 1998. Recreation demand models with taste differences over people. Land Econ. 74, 230–239.
Zhang, Weiwen, Wang, Wen, Li, Xuewen, Ye, Fangzhi, 2014. Economic development and farmland protection: an assessment of rewarded land conversion quotas trading in Zhejiang, China. Land Use Policy 38, 467–476.
Zhao, Yuluan, Zhang, Meng, Li, Xiubin, Dong, Shunzhou, Huang, Dengke, 2016. Farmland marginalization and policy implications in mountainous areas: a case study of Renhuai City, Guizhou. J. Resour. Ecol. 7 (1), 61–67.