

# Environment for Development

Discussion Paper Series

Dec. 08, revised Sept. 09 ■ EfD DP 08-35-REV

---

## Forestland Reform in China: What Do the Farmers Want?

*A Choice Experiment in Farmers' Property  
Rights Preferences*

Ping Qin, Fredrik Carlsson, and Jintao Xu



Environment for Development



RESOURCES  
FOR THE FUTURE

# Environment for Development

The **Environment for Development** (EfD) initiative is an environmental economics program focused on international research collaboration, policy advice, and academic training. It supports centers in Central America, China, Ethiopia, Kenya, South Africa, and Tanzania, in partnership with the Environmental Economics Unit at the University of Gothenburg in Sweden and Resources for the Future in Washington, DC. Financial support for the program is provided by the Swedish International Development Cooperation Agency (Sida). Read more about the program at [www.efdinitiative.org](http://www.efdinitiative.org) or contact [info@efdinitiative.org](mailto:info@efdinitiative.org).

## Central America

Environment for Development Program for Central America  
Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)  
Email: [centralamerica@efdinitiative.org](mailto:centralamerica@efdinitiative.org)



## China

Environmental Economics Program in China (EEPC)  
Peking University  
Email: [EEPC@pku.edu.cn](mailto:EEPC@pku.edu.cn)



## Ethiopia

Environmental Economics Policy Forum for Ethiopia (EEPFE)  
Ethiopian Development Research Institute (EDRI/AAU)  
Email: [ethiopia@efdinitiative.org](mailto:ethiopia@efdinitiative.org)



## Kenya

Environment for Development Kenya  
Kenya Institute for Public Policy Research and Analysis (KIPPRA)  
Nairobi University  
Email: [kenya@efdinitiative.org](mailto:kenya@efdinitiative.org)



## South Africa

Environmental Policy Research Unit (EPRU)  
University of Cape Town  
Email: [southafrica@efdinitiative.org](mailto:southafrica@efdinitiative.org)



## Tanzania

Environment for Development Tanzania  
University of Dar es Salaam  
Email: [tanzania@efdinitiative.org](mailto:tanzania@efdinitiative.org)



School of Business,  
Economics and Law  
UNIVERSITY OF GOTHENBURG



# **Forestland Reform in China: What Do the Farmers Want? A Choice Experiment in Farmers' Property Rights Preferences**

Ping Qin, Fredrik Carlsson, and Jintao Xu

## **Abstract**

Various decentralization experiments are currently underway in the Chinese forestry sector. However, a key question often ignored by researchers and policymakers addresses what farmers really want from reform. This paper uses a survey-based choice experiment to investigate farmers' preferences for various property-rights attributes of a forestland contract. We found that farmers are highly concerned with what types of rights a contract provides. Reducing perceived risks of contract termination and introducing a priority right in the renewal of an old contract significantly increase farmers' marginal willingness to pay for a forest contract. An extended waiting time for rights to harvest the forest reduces a farmer's perceived value of a contract. Farmers are also concerned with the tenure length. In one region, the annual willingness to pay for a 50-year contract is even higher than the annual willingness to pay for 25-year contract.

**Key Words:** China, choice experiment, forest, MWTP, property rights

**JEL Classification:** D61, Q15, Q23, Q50, Q51

© 2009 Environment for Development. All rights reserved. No portion of this paper may be reproduced without permission of the authors.

Discussion papers are research materials circulated by their authors for purposes of information and discussion. They have not necessarily undergone formal peer review.

## Contents

<b>Introduction</b> .....	<b>1</b>
<b>1. Design of the Property Rights Choice Experiment</b> .....	<b>3</b>
1.1 The Attributes .....	5
1.2 Design of Choice Sets.....	8
<b>2. Econometric Model</b> .....	<b>8</b>
<b>3. Results</b> .....	<b>9</b>
3.1 Descriptive Statistics.....	10
3.2 RPL Results for Choice Experiment.....	12
3.3 Willingness-to-Pay Results.....	15
<b>4. Conclusions</b> .....	<b>18</b>
<b>References</b> .....	<b>21</b>
<b>Appendix</b> .....	<b>23</b>

# Forestland Reform in China: What Do the Farmers Want? A Choice Experiment in Farmers' Property Rights Preferences

Ping Qin, Fredrik Carlsson, and Jintao Xu\*

## Introduction

Property rights theory is of fundamental interest to economists, due to the importance of understanding investment decisions (Demsetz 1967). Furthermore, property rights are preconditions for economic growth (North 2005). They are often defined and modeled as a bundle of rights, e.g., tenure security, transfer right, collateral right, etc.<sup>1</sup> One central issue regarding property rights in recent economic research focuses on the link between property rights and investment incentives (e.g., Jacoby et al. 2002; Besley 1995; Feder 1987; Li et al. 2000). The main evidence here is that improved property rights are important for rural development, since investment can only flourish when there is a reasonable chance of reaping reward from it.

In economic models, it is often assumed that private ownership creates incentives for owners to utilize resources more efficiently, compared to common ownership (Demsetz 1967). However, this does not always mean that everyone wants private ownership, particularly not in countries where it is rare. According to Kung (1994; 1995), Chinese farmers do not necessarily prefer private ownership when it comes to agriculture; in fact, farmers' preferences about the period of a specific contract vary across regions. There are also other factors—not only farmers' preferences—that explain property-rights structure. For example, Liu et al. (1998) suggested that privatization is more likely to appear in areas where the state has the least to lose or the least to fear; and where the individual option value of future land access is the highest, land rights have

---

\* Ping Qin (corresponding author), Environmental Economics Program in China (EEPC), College of Environmental Sciences and Engineering, Peking University, 100871 Beijing, China, and visiting scholar, Resources for the Future, 1616 P Street, NW, Washington, DC, 20036, USA, (tel) +1 202 328 5189, (email) [Qin@rff.org](mailto:Qin@rff.org); Fredrik Carlsson, Department of Economics, University of Gothenburg, PO Box 640, SE 405 30, Gothenburg, Sweden, (tel) + 46 31 7864174, (email) [Fredrik.Carlsson@economics.gu.se](mailto:Fredrik.Carlsson@economics.gu.se); and Jintao Xu, Environmental Economics Program in China (EEPC), College of Environmental Sciences and Engineering, Peking University, 100871 Beijing, China, (tel) + 86 10 62767657, (email) [Xujt@pku.edu.cn](mailto:Xujt@pku.edu.cn).

The authors gratefully acknowledge the financial support from Sida (Swedish International Development and Cooperation Agency) to the Environmental Economics Unit at the University of Gothenburg. We also received valuable comments from Francisco Alpizar, Göran Bostedt, Håkan Eggert, Haoran He, David Layton, Martin Linde-Rahr, and seminar participants at the University of Gothenburg.

<sup>1</sup> Dasgupta (1982) refers to property as “a set of rights to control assets.”

been privatized the least. Rozelle and Li (1998) offered an innovative explanation of land-rights formation in China: land rights may be set by village leaders in pursuit of their objectives, subject to local policy and endowment constraints.

This paper investigates Chinese farmers' preferences regarding a set of property-rights attributes of a forest contract. Unlike Kung (1994; 1995), this study provides a novel experimental analysis (choice experiment) of farmers' preferences about private forest contracts with different attributes. This means that we can show policymakers the relative importance of these attributes, given the estimated individual marginal willingness to pay (WTP) for them. This information can be particularly relevant and useful in cases where policymakers decide to carry out the reform in a gradual, experimental manner.<sup>2</sup> Since this is typical of how reforms are implemented in China, identification of the most important policy attributes can help policymakers determine what to prioritize and how to avoid fast and comprehensive implementation of major policy changes, which could be very costly.

There are good reasons why we chose a survey-based choice experiment to investigate farmer preferences. First, it is difficult to use a revealed preference method. Since forestry reform is currently underway and most of the policy attributes do not yet exist, we did not have revealed preference data to rely on. Second, it was not likely that we would observe enough variability in some of the contract attributes. Even if dramatic policy changes follow forestry policy reforms, a few key policies are expected to have little or no variability, such as the harvest quota policy in the forest sector. Finally, the policy attributes might be endogenous. Therefore, even if revealed preference data did exist, we suspect that it would be of limited use in developing a reliable and valid model of how behavior changes in response to a change in the policy variable.

Unlike other studies, we focused on the forestry sector to study farmers' preferences for property rights. The forestry sector is an interesting case since it is undergoing reform, and some forestry policies are quite controversial. Researchers and policymakers typically describe the Chinese collective forestry sector as weathering a number of policy changes and even policy reversals (Liu 2001). However, it is unclear what the farmers actually prefer. Specifically, do farmers perceive forestry sector policies as uncertain or have researchers exaggerate this? If

---

<sup>2</sup> China's transition has often been portrayed as a gradual and experimental process, expressed as—using Deng Xiaoping's widely quoted phrase—"groping for stones to cross the river" (Lin et al. 2003).

given a choice, what value would farmers put on various policy attributes of a contract? Furthermore, how do farmers view the controversial harvest-quota policy and what is the relative importance placed on this policy? To answer these questions, we designed a choice experiment and conducted a household survey in Guizhou, a province in southwest China. In 2007, Guizhou started a pilot program of forest tenure reform for the village forestry collective in nine counties. As in other Chinese provinces, forestry tenure reform in Guizhou focuses on transferring forestry resources to individual households and empowering individuals with more responsibility for the collective forestland. This is thus a highly suitable case for our study, and its results provide relevant inputs for policymakers who are designing forestry contracts for the forthcoming, full-scale forestry-tenure reforms.

The rest of the paper is structured as follows. Section 1 describes the attributes and levels in the choice experiment, and section 2, the econometric framework. The results are discussed in section 3, and section 4 concludes the paper.

## **1. Design of the Property Rights Choice Experiment**

In our choice experiment, we asked the respondents to choose a contract for a hypothetical forestland. Figure 1 outlines the choice experiment scenario. In the introduction to the experiment, we described the forestland to the respondents and told them both the tenure length of a contract and the number of rotation cycles. We set the rotation cycles of timber on the forestland at 25 years, and the contract had three possible tenure lengths—25, 50, and 75 years—to match the rotation cycles. The inheritance right of a forest contract was granted to the respondents' children or grandchildren, since the longest contract was 75 years. Next, we explained the attributes used in the choice experiment to the farmers. To facilitate the interview, we provided each respondent with a separate fact card describing the attributes. Figure 1 shows the scenario that each respondent saw.

The profit of a harvest from a 2-mu plot is around China yuan renminbi (CNY) 7,200; the replanting cost is around CNY 200. This information was not given to the respondents, but since they all are experienced forest farmers, we expected that they would have good information about the value of the future harvests. A detailed description of the attributes and their levels is given in table 1.

**Figure 1. Choice Experiment Scenario Provided to Farmers**

We want to understand what kinds of forest contracts you would prefer. Please think about a situation where the village offers you different types of contracts for a specific plot, and where you can only choose one of the contracts. The plot is located near the village and has good fertility, irrigation, and slope. The size of the plot is 2 *mu*,\* and it is covered by timber forest. The rotation age of the particular timber species is about 25 years. Last year, trees were planted on the plot. You will need to replant the same species and the same number of plants, and then give the forestland back to the village when the contract ends. The contract can be inherited by your children or grandchildren.

We will ask you to compare two different types of contracts for a specific plot. You will make seven choices, but you should see each choice as separate from the others. We ask several questions because we would like to see your choices in different situations. We will show pairs of cards that describe contracts you can choose from. We would like to know which of the two contracts in each pair you would choose or if you would rather not have a contract in that situation. There is no right or wrong answer; we are only interested in the choices you make. This is not a real situation, but we nevertheless ask you to make your decisions as if they were real.

\* *Mu* is a Chinese unit of measure. 1 *mu* = 1/15 hectare.

**Table 1. Attributes and Attribute Levels**

Attributes	Description	Levels
Payment	Annual payment for a forestland contract	CNY 30, 60, 75, 90,120 *
Tenure length	Length of the contract	25, 50, 75 years
Risk of termination of a contract	This describes whether the contract will be prematurely terminated. If a contract is prematurely terminated, the farmer receives a small compensation, the size of which is undetermined. The risk is 5 out of 100 that the contract will be terminated.	No, Yes
Harvest quota	When the farmer applies for a harvest right, the farmer does not always get it. With this contract, there is a 50% chance that the farmer will get a harvest right when applying. If the farmer does not get it, the farmer will have to wait 1, 2, or 4 years before harvesting.	1, 2 , 4 years

---

First right to renew a contract	This describes whether the farmer will be given priority to renew the contract at expiration. Note that the farmer does not know the price of the renewed contract. The price could be higher or lower than that of the old contract.	No, Yes
---------------------------------	---	---------

---

\* US\$ 1 = CNY 7.42 at the time of the survey (November 2007).

---

### 1.1 The Attributes

Since the forest sector has an institutional background and a policy regime similar to the agricultural sector, we included some policy attributes that have proved to be important in the agricultural literature. We also included some policy attributes particular to the forestry sector, identified in discussions with experts (mainly researchers specialized in forestry) and focus groups with farmers. We tested the survey in focus groups and conducted a small pilot study in Guizhou. Eventually, we were able to identify five important policy attributes to include in our contract design: annual payment of a forest contract, tenure length, risk of termination of a contract, harvest quota, and first right to renew a contract.

#### Payment

In the experiment, the payment was an annual payment for a forestland contract, rather than a lump-sum payment, for two reasons. First, in most cases, annual payments fit with how local village collectives collect forestland usage fees today. Second, had the experiment described a lump-sum payment, a majority of households would most likely not be able to afford such a large amount of money, which would exclude them from certain choice sets. We argue that it would not be a reasonable payment scheme if, say, 50 percent of all respondents did not want to choose a contract from the alternatives. The annual payment and its five levels were ultimately decided after the pre-test in the pilot experiment.

#### Tenure Length

In practice, contract length varies from village to village, since there is no specific requirement regarding it. The only condition from the central government is that forestland users must have the option to contract land for 30–70 years. Based on the information from a collective forest tenure-reform survey in Fujian and a pilot survey in Guizhou, we decided that a rotation cycle of 25 years was reasonable to most local farmers. We then varied the level of tenure length by multiplying the rotation cycle, leading to lengths of 25, 50, and 75 years. The

range is also reasonable because it is in line with the range stipulated by the central government. At the same time, it had enough variation for us to be able to observe farmers' preferences about tenure lengths of a contract.

### **Risk of Termination of a Contract**

We selected this attribute to assess how much farmers value a reduction in the risk of premature termination of a contract. We designated two attribute levels: a 5-percent probability that the contract will be prematurely terminated, and zero probability that the contract will be prematurely terminated. An overview of the literature suggests that tenure security can be measured in several ways. Brasselle et al. (2002) measured tenure security in terms of inheritance, the right to lend and give, and the possibility of leasing and selling, and then constructed an index to represent tenure security. In the context of Chinese villages, most researchers use the frequency of land redistribution to capture tenure insecurity in agricultural land. Alternatively, a few studies have used tenure length to capture farmers' perceptions of tenure security. There are, however, several reasons why none of these measurements were suitable for our purpose.

First, farmers would have difficulty understanding tenure security if it were measured by an index made up of various attributes. Second, the agricultural sector has no such forestland redistribution system. Third, tenure length was included to capture farmers' preferences for how long a contract they would like. Hence, we believe that the attribute "risk of termination of contract" is a more reasonable measure because it virtually coincides with farmers' experiences with previous forest policy change. For example, the village collective took back the forest contract from individual households when the household management system reverted to collective management. Meanwhile, evidence regarding a few government policy reversals toward household ownership and use of trees over the last 25 years was found in several studies (Yin and Xu 1987). Therefore, we believe that this measure mostly captures farmers' perception of insecurity in a collective forest sector.

## Harvest Quota

Harvest quota is a forestry policy imposed by the central government. It requires that a farmer apply for a quota in order to gain the right to harvest timber.<sup>3</sup> Due to the limited number of quotas allocated to each village, there is possibility that farmers would not get a quota for mature forests when they want it. Timber harvesting without a quota is defined as illegal logging. Farmers might have to reapply for a quota the following year if they did not obtain one the first year and do not consider illegal logging to be an alternative. Quotas are allocated on a yearly basis.

To assess the impact of quota policy on forest farmers, we designed a policy attribute that described the rules and procedures of how the quota policy is implemented. It was constructed by varying how long the farmers would have to wait for a quota if their application was rejected the first year. In this scenario, there was only a 50-percent chance that they would get a quota the first year. This design mimicked the actual market situation that farmers faced. We used one, two, and four years of waiting for the quota if an applicant did not get the quota the first year.

## First Right to Renew the Contract

One concern for the farmer is whether the contract can be renewed upon expiration. The possibility of renewing a contract provides farmers with more options when making a contract choice. Farmers are thus not necessarily forced to choose a long contract to secure the user rights to a forestland. Alternatively, we can interpret this right as another dimension of tenure security. Tenure insecurity arises from the fact that farmers might not be able to get the same farm plot in the future, regardless of how much they have invested in that plot. Thus, the attribute “risk of termination of a contract” can be perceived as a measure of current tenure security, while the attribute “first right to renew the contract” can be perceived as an indication of future tenure security (Kung and Liu 1996).<sup>4</sup> In the experiment design, we included two levels of the attribute: 1) there is a first right to renew the contract, and 2) there is not a first right to renew the contract.

---

<sup>3</sup> When determining quotas, the central forest authority calculates the annual allowable harvest for each province, based on the national inventory carried out every five years. The provinces then allocate the quotas to the counties, then to the townships, and finally to the villages. Farmers apply for permission to harvest timber through township forestry stations.

<sup>4</sup> Note that “risk of termination of a contract” is a negative attribute, while “first right to renew the contract” is a positive attribute.

## 1.2 Design of Choice Sets

We used a cyclical design to construct the choice sets. A cyclical design is a simple extension of the orthogonal approach, in which the attribute level in the new alternative is the next higher attribute level to the one applied in the previous alternative. If the highest level is attained, the attribute level is set to its lowest level (Bunch et al. 1996). This design has level balance, orthogonality, and minimal overlap. Huber and Zwerina (1996) identified four principles in efficient choice design: 1) orthogonality, 2) level balance, 3) minimal overlap, and 4) utility balance. Utility balance was not considered in our design. It was not clear in this particular case whether one alternative would dominate another alternative, since we did not know whether farmers preferred long or short tenure. We used the OPTEX procedure in SAS (statistical analysis software), which is a linear D-efficiency design procedure, to create 14 choice sets and randomly block them into two versions. Hence, there are seven choice sets in each version.

One concern in this choice experiment was whether poorly educated farmers would be able to make repeated choices with five attributes. We used six choice sets in our pilot survey, which worked without any problems for most respondents. In the final design, we decided to consider the two-way interaction effects.<sup>5</sup> Therefore, we needed to present each respondent with seven choice sets to enable estimation of the interaction effect. In each choice set, we asked the respondents to choose among three alternatives; the third choice was the “opt out” alternative, i.e., abstaining from signing a contract. All respondents were informed of each of the three alternatives. (See table 1 in the appendix for an example of a choice set for forest contracts 1.)

## 2. Econometric Model

The theoretical foundation of the choice experiment approach is rooted in the Lancasterian consumer theory (Lancaster 1966), as well as in the random utility theory (McFadden 1974; Manski 1977). A concise summary of the conceptual framework that outlines an individual’s decision making and choice process can be found in Louviere et al. (2000). Although sharing the same theoretical foundation with the contingent valuation method, the choice experiment approach focuses on respondent preferences regarding the attributes of the scenarios in the design, rather than on specific scenarios. Respondents are asked to choose the alternative they

---

<sup>5</sup> The two-way interaction is between “tenure length” and “risk of termination of a contract,” and the assumption is that “risk of termination of a contract” can be valued differently for different tenure lengths.

would prefer. Considering the choice of contract in the study, if we assume that utility depends on choices made from the set of  $C$  alternatives, the random utility function can be specified as:

$$U_{igt} = V_{igt} + \varepsilon_{igt}, \quad (1)$$

where  $g$  denotes individual,  $i$  is alternative, and  $t$  is the choice situation. The utility is decomposed into a non-random part ( $V_{igt}$ ) and a stochastic part ( $\varepsilon_{igt}$ ). The systematic part of the utility can be expressed as  $\beta' x_{igt}$ , where  $x_{igt}$  is a vector of observed variables. Alternative  $i$  is chosen over alternative  $j$ , if  $U_{igt} > U_{jgt}$ .

We estimated the models with a random parameter logit (RPL) model. The popularity of the RPL model rests on two advantages. First, unobserved heterogeneity preference is accounted for in economic analysis by allowing model parameters to vary among individuals. Second, the IIA (independence of irrelevant alternative) assumption is relaxed with this model. We included an alternative specific constant for the opt-out alternative and assumed that all attribute parameters, other than the cost parameter, are normally distributed. This means that we did not restrict the sign of a coefficient to be only negative or only positive. For some of the attributes, it is clear that we cannot restrict the sign, for example, tenure length. The models are estimated with NLOGIT 4.0, using simulated maximum likelihood with Halton draws with 500 replications. See Train (2003) for details on simulated maximum likelihood.

### 3. Results

We conducted the survey in September 2007. A total of 210 randomly selected households in 11 villages from 2 counties (Jin Ping and Ma Jiang) in Guizhou Province participated in the choice experiment and household survey.<sup>6</sup> Jin Ping and Ma Jiang are both located in the southeast part of Guizhou and are important forestry counties. In 2007, Jin Ping was selected as one of nine counties to participate in a pilot project of a forestry tenure reform. Thus, Jin Ping is undergoing a gradual shift from a centralized to a decentralized forestry

---

<sup>6</sup> Six villages were randomly selected from Jinping and 5 from Majiang. We randomly selected 10 households from the first village in Jin Ping, and 20 households from all other villages. In total, 110 respondents came from Jinping, and 100 from Majiang. This means 210 questionnaires were available for analysis and all of the respondents answered all seven choice sets.

management system. By contrast, Ma Jiang still maintains collective management of forests. One issue in China's forest sector is whether there should be collective management or household management. Therefore, the two counties represent two different examples of forest management.

### 3.1 Descriptive Statistics

Guizhou is one of the poorer provinces in China. The gross domestic product per capita was around CNY 5,700 in 2006, which is the lowest among all provinces, accounting for only 15 percent of the average Chinese gross domestic product per capita—CNY 37,000 in 2006 (see NBS 2007). Our sample's average per capita income was CNY 2,882, which is slightly higher than the village mean of CNY 2,502, but below the provincial mean of CNY 5,409. Table 2 shows that the average respondent age was 49 years. The average number of years of schooling was almost 6, while the average in the province was 6.75 years.

**Table 2. Descriptive Statistics**

Variable	Description	Mean	Std. deviation
<b>Attributes</b>			
Tenure, 50 years	The contract has a 50-year tenure (1=yes, 0=no)	0.24	0.43
Tenure, 75 years	The contract has a 75-year tenure (1=yes, 0=no)	0.24	0.43
First right to renew the contract	The household has the first right to renew the contract (1=yes, 0=no)	0.33	0.47
Risk of termination	There is a risk of contract termination (1=yes, 0=no)	0.33	0.47
Harvest quota	Number of years the household has to wait for a harvest quota	2.86	1.30
Cost	Annual payment for the forestland in CNY	51.07	43.56
<b>Socio-economic variables</b>			
Age	Respondent's age in years	49.49	12.41

Education	Respondent's education in years	5.97	2.99
Auction allowed	Transfer of the forest land is allowed via auction (1=yes, 0=no)	0.55	0.50
House value	The value of the house in 2007 (CNY 10,000)	1.79	2.70

In the choice experiment, 7 percent of the farmers (15 respondents)<sup>7</sup> never chose to contract forestland. Follow-up questions revealed that the reason was usually labor shortage in the family, not being able to afford the annual required payment to hold a contract in forestland, or a perceived lack of forest management skills. In order to obtain a comprehensive picture of the farmers' views on the reform, we also asked a number of questions regarding respondents' views on the ongoing or upcoming tenure reform of forestland. The results are presented in table 3.

When asked who should be in charge of the forestland, 95 percent of the respondents supported the idea that it should be allocated to individual households for management rather than control by the village collective as before. This is not surprising since the farmers had more than 20 years of experience with an agricultural reform that established better-defined property rights, bringing substantial benefits to them. We could expect the enthusiasm for a similar decentralization system in forestry to be very high. More surprising was that around 56 percent preferred auctioning the forestland instead of buying at a fixed price. Allocation of forestland among villagers through the market is definitely something new to rural societies. Although there is emerging evidence that some villages are experimenting with decentralization through auctions, it is largely unfamiliar to most forest farmers. In most cases, the price of getting a contract for the forestland, as well as the payment scheme, is mainly decided by the village collectives, although some farmers are involved in negotiations about the price of a contract with the local authority. Therefore, it is remarkable that farmers want to rely on the market to allocate forestland.

Two possible reasons might explain why farmers feel positive about auctions, even though they might result in higher contract prices. First, an auction might generate more village revenue, which can bring more benefits to the local villages by providing more public services.

---

<sup>7</sup> Seven farmers in Jinping and eight farmers in Majiang did not choose any contract in the seven choices.

Second, the villagers see the auction as a more transparent procedure for allocating collective resources.

In terms of access to village forestland, 60 percent of the respondents supported the proposal that farmers from outside the village should be able to get a contract. Among the villagers who did not support this proposition, 62 percent changed their minds when told that the local community could get more money and spend it on the village infrastructure as a result of the proposition, since outsiders are able to offer more for a contract. Still, the remaining 38 percent insisted that only local villagers should be entitled to contract the village forestland.

**Table 3. Farmers' Attitudes toward the Forest Tenure Reform (%)**

	Yes	No
1. Is it a good idea to transfer the forestland to the individual households for management?	95	5
2. Which way of transferring the local forestland do you prefer—fixed price or auction?	44*	56**
3. Should persons from outside your village be allowed to get contracts in your village?	60	40
4. Should persons from outside your village be allowed to get contracts in your village if the village gets more money to spend on infrastructure, schools, and health care by letting people from other villages get contracts?	62	38

\* Fixed price. \*\* Auction.

### **3.2 RPL Results for Choice Experiment**

As mentioned, the forest management systems are different in the two sampled regions, and consequently we estimated separate models for each region. In order to test whether individual-specific characteristics explained the respondents' contract choice, we included the interaction between the alternative-specific constant and socioeconomic variables in the estimation. In addition, for simplicity, we expressed one attribute as “no risk of termination,” rather than as “risk of termination.”

To begin with, we estimated separate models for the two regions without socioeconomic characteristics. (The results of the RPL model are reported in table 2 in the appendix.) They are estimated with simulated maximum likelihood, using Halton draws with 500 replications.<sup>8</sup> The estimated models showed that farmers in the two regions had similar preferences, except for the tenure attribute. Yet, at this stage, we needed to be careful with the analysis of an overall comparison, as the estimated parameters in the two subsamples are confounded with the respective scale factor. Hence, we tested the hypothesis that the subsamples shared the same population parameters, controlling for scale factor differences. We did this with a likelihood ratio test, where the scale parameter was estimated with a simple grid-search procedure.<sup>9</sup> The results suggested that we could not reject the hypothesis of both equal parameters and equal scale factors. Therefore, we decided to proceed with a model on the pooled data. In the pooled sample estimation, a regional dummy was introduced to interact with the tenure attribute to accommodate preferential differences across regions.<sup>10</sup>

Table 4 reports the RPL models. In the final specification, we included two dummy variables for the harvest quota attribute. This allowed for a non-linear effect on the marginal WTP to avoid having to wait for the right to harvest.<sup>11</sup> We also decided to include different alternative specific constant for Majiang and Jinping due to the large difference observed in the separate estimation results for each region. (See table 2 in the appendix.)

The alternative-specific constants were negative, and most of the interaction terms were negative, suggesting that a majority of farmers prefer a contract with village collectives. The estimated standard deviations of the random parameters were highly significant, implying that we were able to capture unobserved heterogeneity. Both tenure length coefficients were

---

<sup>8</sup> We also investigated the interaction effect between tenure and the risk of contract termination. The insignificance of this effect led us to proceed without it.

<sup>9</sup> A detailed description of the test can be found in Swait and Louviere (1993). Since estimated parameters are confounded with scale parameters, we accounted for scale factor differences to test parameter differences, using the grid-search procedure. Given the estimated scale parameters, we tested whether there were real differences in estimated parameters between the two subsamples.

<sup>10</sup> All interaction variables between the random parameters and the regional dummy were insignificant, except for the 50-year tenure contract attribute. Therefore, we only included interaction effect with tenure attribute in the final model specification.

<sup>11</sup> The two dummy variables are “harvest quota, waiting for 2 years” and “harvest quota, waiting for 4 years,” meaning that the waiting time for a quota was increased by 1 and 3 years, respectively, compared to the reference alternative “harvest quota, waiting for 1 year.”

insignificant in Majiang estimation.<sup>12</sup> The negative sign indicated that the longer the contract tenure, the less likely it is to be chosen, but again, both coefficients were insignificant. However, note that in terms of total WTP farmers are still likely to pay more for a 50-year contract than a 25-year contract, since they are paying for 50 years instead of 25 years. Forestry farmers in the reform region Jinping are more likely to choose a contract with 50-year tenure, compared to the reference alternative of 25-year tenure; this can be seen from the positive interaction effect between 50-year tenure and the regional dummy. However, we did not find a similar effect from the interaction term for a contract with 75-year tenure, which was insignificant.

All parameters of the other three policy attributes were highly significant, suggesting that these attributes do influence individuals' choice of a contract. Forest farmers had a positive preference for the attributes of "no risk of termination" and "a first right to renew an expired contract." The negative sign for the harvest-quota dummy variables suggests that an extended waiting time reduced the perceived value of a forestry contract. Among the socio-economic variables, a farmer's age was negatively significant in Jinping, suggesting that an older farmer is less likely to take a contract. In addition, farmers in Majiang who preferred auctioning of land are more likely to take a contract. This can be a reflection that they are more confident and competitive in their forest management skills.

**Table 4. RPL Estimation Results with Pooled Sample**

	Coefficient	Std. error
ASC, Jinping <sup>a</sup>	-4.18**	1.85
ASC, Majiang <sup>a</sup>	-2.99	2.04
Tenure, 50 years	-0.22	0.32
Tenure, 50 years, * Jinping region <sup>b</sup>	0.73*	0.41
Tenure, 75 years	-0.29	0.40
Tenure, 75 years, * Jinping region <sup>b</sup>	0.19	0.56
First right to renew contract	1.06***	0.21
No risk of termination	1.22***	0.18
Harvest quota, waiting for 2 years	-0.94***	0.22

<sup>12</sup> When we say the effect of "tenure, 50 years" and "tenure, 75 years," it is always compared with the base scenario "tenure, 25 years." We estimated a model with an interaction term between "tenure length" and "risk of termination of a contract" in the estimation and it was insignificant, which suggests that farmers' perceived risk of contract termination did not differ with tenure length.

Harvest quota, waiting for 4 years	-0.77***	0.23
Cost	-0.007**	0.003
Age*Jinping	-0.03**	0.02
Education*Jinping	-0.11	0.07
Auction allowable*Jinping	-0.06	0.46
House value*Jinping	0.40**	0.18
Age*Majiang	-0.01	0.02
Education*Majiang	-0.10	0.08
Auction allowable*Majiang	0.93*	0.48
House value*Majiang	0.03	0.20
<b>Coefficient std.</b>		
Tenure, 50 years	1.91***	0.26
Tenure, 75 years	3.04***	0.36
First right to renew the contract	1.90***	0.23
No risk of termination	1.54***	0.20
Harvest quota, waiting for 2 years <sup>c</sup>	1.71***	0.31
Harvest quota, waiting for 4 years <sup>c</sup>	2.44***	0.33
Pseudo R-square	0.29	
No. of respondents	210	
No. of observations	1440	
***, **, * significant at the 1%, 5%, and 10 levels, respectively.		
<sup>a</sup> Alternative specific contract: no contract.		
<sup>b</sup> Majiang: region dummy is 0; Jinping: region dummy is 1.		
<sup>c</sup> Reference alternative: "harvest quota, waiting for 1 year."		

### 3.3 Willingness-to-Pay Results

Table 5 presents the estimated marginal WTP results for 50- and 75-year contract tenures, and standard errors are calculated with the Delta method. Note that this is annual marginal WTP per contract, since we used an annual payment as the cost attribute in the choice set. This applies to all the following discussions regarding marginal WTP. As with the tenure attribute coefficients, the sign of the estimated marginal WTP is different for Majiang and Jinping. In Majiang, they are both negative, while in Jinping the marginal WTP is positive for a contract with tenure of 50 years, and negative for a contract with 75 years. However, the marginal WTP is not significantly different from zero in any of the cases. In any case, the interpretation is not that

straightforward, and it does not necessarily mean that farmers do not prefer or prefer longer contracts. For a contract with several rotations, the profit of the first rotations is a large part of the present value of total future profits.<sup>13</sup> Therefore, it is not at all clear that the annual WTP for a contract should increase with longer tenure. Actually, given the level of the profit for a typical contract and a reasonable discount rate, the annual WTP should decrease with increased tenure length. Therefore, our interpretation of the insignificant difference in annual marginal WTP between contracts with different tenure length is an indication of a preference for longer contracts.

The marginal WTP for the other attributes is highly significant. In general, the results suggest that forestry farmers would be willing to pay a substantial amount of money to reduce uncertainty in forestry management. The uncertainty is due to either the risk that the contract will be prematurely terminated by the village for whatever reason, that there will be no harvest quota available when the farmers need it, or even that there will be no possibility of renewing a contract when it expires. The marginal WTP is CNY 159 for an improvement in current tenure security, and CNY 139 for an improvement in future tenure security. In addition, the marginal WTP is CNY 123 for a reduction of the waiting time for a quota by one year, and CNY 101 for a reduction of the waiting time for a quota by three years. However, if we asked farmers to compare a contract that implies waiting for two years for a quota to one that implies waiting for 4 years, no significant preference is revealed.<sup>14</sup> In our opinion, this is additional important evidence that farmers suffer when there is an extended waiting time for a quota.

In order to understand the relative importance of these policy attributes, we ranked the marginal WTP of the attributes. Forest farmers in Majiang ranked “no risk of termination” highest, and then “first right to renew the contract,” followed by “harvest quota, waiting time 2 years.” The ranking was the same for Jinping. Overall, the results showed that forest farmers in both regions valued the current tenure security and future tenure security as the most important attributes. This conforms to the concern among the forest policymakers and researchers that high uncertainty was created in the forest sector by historical policy changes. More importantly, the

---

<sup>13</sup> For example, the present value of a profit of CNY 7,200 in 25 years with a discount rate of 5% is CNY 2,125. The present value of an additional profit of CNY 7,200 in 50 years is CNY 261.

<sup>14</sup> If we change the reference alternative in the estimation and instead use “harvest quota, waiting time 4 years,” then the coefficient for “harvest quota, waiting time 1 year” is statistically significant, and statistically insignificant for “harvest quota, waiting time 2 years.”

uncertainty has not been reduced with forest tenure reforms. This could have a negative impact on forest performance if farmers lack confidence that a stable forestry policy environment will be created after the forestry tenure reform.

**Table 5. Mean Marginal Willingness to Pay in CNY for All Attributes**

	Mean MWTP	Std. error
<b><i>Jinping</i></b>		
Tenure, 50 years	67.06	50.80
Tenure, 75 years	-13.54	52.66
<b><i>Majiang</i></b>		
Tenure, 50 years	-28.74	41.55
Tenure, 75 years	-38.47	55.23
First right to renew the contract	138.97**	66.99
No risk of termination	159.40**	68.30
Harvest quota, waiting time 2 years	-123.16**	60.98
Harvest quota, waiting time 4 years	-101.03*	52.55

\*\*\*, \*\*, \* significant at the 1%, 5%, and 10% level respectively.

It is also of interest to estimate the WTP for a contract. For both regions, the alternative specific constant was negative, indicating that farmers on average are willing to buy contracts. As shown in table 5, the willingness to pay for a certain contract depends on the terms of the contract. For simplicity, we estimated the WTP for the three different tenure lengths at sample mean of all the other variables and attributes. The results are reported in table 6, and standard errors are calculated with the Delta method.

The annual WTPs for both regions and for all three rotations are large in comparison with the present value of the expected harvest. For example, the present value of a profit of CNY 7,200<sup>15</sup> with a discount rate of 5 percent is around CNY 2,125. The present value of annual

<sup>15</sup> This is the estimated profit from a plot of the size of 2 mu.

payments of CNY 314 during 25 years using the same discount rate is around CNY 4,425. One reason for this difference could be that farmers estimate the profit to be higher, but the profit would have to be substantially higher to explain the estimated willingness to pay. Instead, we believe that this is a sign of hypothetical bias in the sense that farmers have tended more to opt for a contract than what they would actually have done if the choice was for real. This is inline with their expressed interest in forest contract reform, so they have an incentive to state that they would actually purchase a contract if they had the opportunity. Therefore, one should interpret the magnitude of the WTP estimates with some slight skepticism, but they are still an indication of the fact that farmers would indeed like to obtain forest contracts.

**Table 6. Mean WTP in CNY for a Contract at Different Tenure Lengths**

	Mean WTP	Std. error
<b><i>Jinping</i></b>		
Tenure, 25 years	314	101
Tenure, 50 years	382	133
Tenure, 75 years	301	104
<b><i>Majiang</i></b>		
Tenure, 25 years	396	131
Tenure, 50 years	367	128
Tenure, 75 years	358	121

#### 4. Conclusions

What property right attributes are important to forestland farmers in China? Based on a choice experiment, we assessed farmers' valuation of various property right attributes in collective forestry. The study was conducted in China's southwestern province, where collective forestry reform has not yet formally started. Hence, it is a suitable place to conduct this type of research since it can provide policy makers with useful inputs for future policy reforms. The major findings are that 1) farmers are concerned with both the rights they get in a contract and the tenure length, and 2) farmers are very sensitive to any uncertainty related to a forestry contract. Uncertainty can occur within the contract period, at the end of the contract period, or even after an old contract expires.

Twenty years after the first round of China's forest tenure reform (initiated in the 1980s), tenure security is still a crucial issue that remains unsolved in China's collective forest sector.

Farmers are greatly concerned with the risk of premature contract termination and are willing to pay a high cost to avoid a contract with this attribute. Forest tenure reform is not new to forest farmers. In the 1980s, forestland was distributed to the local farmers for management. However, the forestland was often quickly taken back by village collectives after the reform. So, with these experiences in mind, why would farmers believe that this new reform is different and that it will establish well-defined property rights for individual-managed forestland? While it is no doubt important to promote the performance of forestry through decentralization, experience shows that—equally importantly—forestland management in the long run warrants a stable policy environment so that households gain more confidence in forestland tenure arrangement.

This paper contributes to the literature by analyzing farmers' perceived value of future tenure security of a contract. To our knowledge, this is the first study to separate tenure security into two dimensions—current tenure security and future tenure security—and then examine how important each is to a forest contract. A high marginal WTP for an improvement in future tenure security suggests that farmers place an equal value on a contract with future tenure security as on one with current tenure security. In the Majiang region, farmers prefer contracts with longer tenure, revealed by the fact that the annual WTP does not decrease with tenure length. However, they are also concerned with what rights a contract stipulates. This may partly reflect the lack of confidence in forestry contracts in this collective forestry region, where no formal forest reform has ever been conducted.

In the Jinping region, the farmers have an even stronger preference for longer contract. This can be seen as a positive sign of forest reform, and that confidence in individual forestry management arises as a result of reform policy. However, the fact that marginal WTP is higher for the attribute “a first right to renew a contract” than for “a contract longer than 25 years” may also partly reveal the farmers' prevailing concern for current tenure insecurity, even in a reform region. In addition, farmers are concerned with harvest regulations. The farmers have a clear and strong preference for a contract that includes an extended waiting time for a quota of only one year. This is an important point, since we can expect that any contract that delays the farmers' harvest efforts by more than one year could dampen their incentive to manage a forest plot into the future.

In both the academic and policy spheres of China, it is continually debated whether China's leaders should privatize land. Supporters of privatization contend that land right is one of the areas most in need of reform in the rural sector and that privatization would promote efficiency. Others disagree, arguing that the gains from land privatization would not be large and that, in fact, farmers are not in favor of privatization, since they actually enjoy more security

under current collective ownership of land where tenure rights are devoted to the individual farmers for management.<sup>16</sup> In our study, farmers showed preferences for tenures lasting as long as 75 years. In most cases, only private forestland has tenure as long as 75 years, making farmers perceive the land as their own. Thus, our results can be interpreted as a preference for privatization, and that farmers think they would enjoy more security, compared with the present situation, with longer contracts.

As far as we know, this is the first attempt to use the stated preference method to elicit farmers' preferences for various (the most important) property rights attributes in a contract. We hold that our results are policy relevant and that input of this type can be used to help design contracts that are in line with farmer preferences. There are successful examples of agricultural reform in developing countries, but unsuccessful reform cases are also frequently observed. Among all the factors that will influence the outcome, one crucial factor is whether policy reform leads to a tenure arrangement that fits the needs of the locals (Ostrom 2006). This, however, is often ignored by policymakers.

---

<sup>16</sup> For an extended discussions, see Li et al. (2000)

## References

- Besley, T. 1995. Property Rights and Investment Incentives: Theory and Evidence from Ghana. *Journal of Political Economy* 103(5): 903–37.
- Brasselle, A.S., F. Gaspart, and J.P. Plattera. 2002. Land Tenure Security and Investment Incentives: Puzzling Evidence from Burkina Faso. *Journal of Development Economics* 67: 373–418.
- Bunch, D.S., L. Louviere, and D.A. Anderson. 1996. A Comparison of Experimental Design Strategies for Choice-Based Conjoint Analysis with Generic-Attribute Multinomial Logit Models. Working Paper. Davis, CA, USA: University of California–Davis, Graduate School of Management.
- Dasgupta, P. 1982. *Control of Resources*. Cambridge, MA, USA: Harvard University Press.
- Demsetz, H. 1967. Toward a Theory of Property Rights. *The American Economic Review* 57: 347–59.
- Feder, G. 1987. Land Ownership Security and Farm Productivity: Evidence from Thailand. *Journal of Development Studies* 24 (1): 16–30.
- Huber, J., and K. Zwerina. 1996. The Importance of Utility Balance in Efficient Choice Designs. *Journal of Marketing Research* 33: 307–317.
- Jacoby, H., G. Li, and S. Rozelle. 2002. Hazards of Expropriation: Tenure Insecurity and Investment in Rural China. *American Economic Review* 92(5): 1420–47.
- Kung, J.K. 1994. Egalitarianism, Subsistence Provision, and Work Incentives in China's Agricultural Collectives. *World Development* 22(2): 175–88.
- . 1995. Equal Entitlement versus Tenure Security under a Regime of Collective Property Rights: Peasants' Preferences for Institutions in Post-Reform Chinese Agriculture. *Journal of Comparative Economics* 21 (1): 82–111.
- Kung, J.K., and S. Liu. 1996. Land Tenure Systems in Post-Reform Rural China: A Tale of Six Counties. Working Paper. Hong Kong: Hong Kong University of Science and Technology, Division of Social Sciences.
- . 1997. "Farmers' Preferences Regarding Ownership and Land Tenure in Post-Mao China: Unexpected Evidence from Eight Counties," *The China Journal* 38: 33–63.

- Li, G., S. Rozelle, and J. Huang. 2000. Land Rights, Farmer Investment Incentives, and Agricultural Production in China. Working Paper. Davis, CA, USA: University of California–Davis, Department of Agricultural and Resource Economics.
- Liu, S., M. Carter, and Y. Yao. 1998. Dimensions and Diversity of Property Rights in Rural China: Dilemmas on the Road to Further Reform. *World Development* 26(10): 1789–1806.
- Lancaster, K. 1966. A New Approach to Consumer Theory. *Journal of Political Economy* 74: 132–57.
- Louviere, J.J., D.A. Hensher, and J.D. Await. 2000. *Stated Choice Methods: Analysis and Applications*. New York: Cambridge University Press.
- Lin, J.Y., F. Cai, and Z. Li. 2003. *The China Miracle: Development Strategy and Economic Reform*. Hong Kong: The Chinese University Press.
- Liu, D. 2001. Tenure and Management of Non-state Forests in China since 1950: A Historical Review. *Environmental History* 6(2): 239–63.
- Manski, C. 1977. The Structure of Random Utility Models. *Theory and Decision* 8: 229–54.
- McFadden, D. 1974. Conditional Logit Analysis of Qualitative Choice Behavior. In *Frontiers in Econometrics*, edited by P. Zarembka. New York: Academic Press.
- North, D.C. 2005. Institutions. *New Developments in Economic Sociology* 1: 387–402.
- NBS. 2007. *China Statistical Yearbooks*. Beijing: China Statistical Publishing House.
- Ostrom, E. 2006. *The Evolution of Institutions for Collective Action*. New York: Cambridge University Press.
- Rozelle, S., and G. Li. 1998. Village Leaders and Land Rights Formation in China. *American Economic Review* 88(2): 433–38.
- Swait, J., and J. Louviere. 1993. The Role of the Scale Parameter in the Estimation and Comparison of Multinomial Logit Models. *Journal of Marketing Research* 30: 305–314.
- Train, K.E. 2003. *Discrete Choice Methods with Simulation*. New York: Cambridge University Press.
- Yin, R., and J. Xu. 1987. A Survey of Timber Revenue Distribution before and after Opening the Market. *Forestry Problems* 1: 109–128.

Appendix

**Table 1. An Example of a Choice Set of the Forest Contract in the Questionnaire**

<p style="text-align: center;"><b>What if you were offered the following two contracts? Would you choose either of them, and if so, which one?</b></p>			
	<i><b>Contract 1</b></i>	<i><b>Contract 2</b></i>	<i><b>No contract</b></i>
Tenure length (years)	75	25	
First right to renew a contract	You will not be given priority to renew the contract when the old contract expires.	This describes whether the farmer will be given priority to renew the contract at expiration. Note that the farmer does not know the price of the renewed contract. The price could be higher or lower than that of the old contract.	
Risk of termination of a contract	The contract will not be prematurely terminated.	This describes whether the contract will be prematurely terminated. If a contract is prematurely terminated the farmer receives a small compensation, the size of which is undetermined. The risk is 5 out of 100 that the contract will be terminated.	You do not get a contract for the plot
Harvest quota	When you apply for a harvest right, you do not always get it. With this contract there is 50% chance that you get a harvest right when applying. If you do not get it, you have to wait 4 years to harvest.	When farmers apply for a harvest right, they do not always get it. With this contract there is a 50% chance that they will get a harvest right when applying. If the farmers do not get it, they will have to wait 1, 2, or 4 years before harvesting.	
Total payment (CNY)	6750	1500	
Annual payment (CNY)	90	60	
<p><b>Your choice:</b> <i>Mark the chosen alternative with an X.</i></p>			

Table 2. Estimation Results of RPL for Each Region

	Jinping	Majiang
	<i>Coefficient</i>	<i>Coefficient</i>
Alternative-specific constant (contract)	-21.24*** (6.80)	-4.19 (7.64)
Tenure, 50 years <sup>a</sup>	0.66*** (0.22)	-0.11 (0.22)
Tenure, 75 years <sup>a</sup>	0.17 (0.27)	-0.18 (0.30)
First right to renew the contract	0.79*** (0.20)	0.58*** (0.19)
No risk of termination of contract	0.97*** (0.19)	0.62*** (0.16)
Harvest quota	-0.15* (0.08)	-0.21** (0.08)
Cost	-0.009** (0.004)	-0.008** (0.004)
	<i>Coefficient std.</i>	<i>Coefficient std.</i>
Alternative-specific constant (contract)	8.97*** (2.02)	7.68*** (1.74)
Tenure, 50 years	0.68** (0.33)	0.93*** (0.32)
Tenure, 75 years	1.93*** (0.34)	2.23*** (0.40)
First right to renew contract	1.21*** (0.24)	1.11*** (0.25)
No risk of termination of contract	0.99*** (0.25)	0.80*** (0.22)
Harvest quota	0.57*** (0.12)	0.51*** (0.12)
Pseudo R-squared	0.38	0.36
No. of respondents	110	100
No. of observations	770	700

\*\*\*, \*\*, \* significant at 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses.

<sup>a</sup> The reference alternative is "tenure, 25 years."