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Impact of property rights reform on household forest management investment: An empirical study of southern China☆,☆☆

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ABSTRACT

Since the early 1980s, China has initiated a series of property rights reforms in the collectively owned forest area to motivate farmers in forest management. Assessment of farmers' behaviors in response to the reforms would be useful when policy adjustments are considered. This paper investigated farmers' participation and investment using labor and money input in forest management as indicators. The data were collected in Tonggu County in southern China. Results indicate that positive attitudes toward the reforms and higher income from forest product sales encourage participation in forest management. In contrast, higher off-farm income would hold back their participation and investment. It was also found that farmers who owned more land and are more confident to get logging quota would manage their forests more intensively. Households having elder and more educated household heads appear less interested in investment in forest management. Some policy implications are presented in this paper.

1. Introduction

There has been a great deal of research on the impact of forest tenure reform on households' forest management behavior. Forest land tenures affect management efficiency, deforestation, planting trees, investment, and allocation of forest land (Wallace and Newman, 1986; Mendelsohn, 1994; Deacon, 1994; Place and Otsuka, 2000). Mendelsohn (1994), Deacon (1994), Besley (1995) and Laarman (1996) argue that the efficiency of forest management could be enhanced through secure land property rights. Place and Otsuka (1997) claimed that land privatization would promote forest investment. A lack of secure land and tree tenure has been suggested as a significant barrier to tree cultivation (Zhang and Pearse, 1996, 1997; Place and Otsuka, 2000; Owubah et al., 2001). Longer terms and more clearly defined tenure provide more economic benefits to their holders and are more likely to stimulate tree planting (Zhang and Pearse, 1996). The duration of tenure determines whether farmers would plant trees or short term crops (Sellers, 1988). Palo (1994) argues that a certain minimum share of privately owned forests is important to support competitive timber markets and sustainable forestry.

China has implemented significant institutional reforms on collectively owned forests since the early 1980s. Various forms of reforms were practiced from place to place. Shen et al. (2009) argue that the disparity is caused by local socio-economic condition at the time of policy implementation. It is widely believed that the reform in the 1980s caused serious deforestation as farmers were not confident about the institutional stability (e.g., Li, 2008). The recent reform implemented in the early 2000s is thought to motivate farmers to participate in forest management by transforming collective use rights into private ones, and is regarded as an extension of the household contract responsibility system from the agriculture sector into the forestry sector (Chen, 2006).

Different from the mixed results of studies on the earlier reforms (Zhang et al., 2000; Li, 2008), positive impacts of the recent reforms have been generally identified (Zhu and Xiao, 2007; He and Zhu, 2009), and regional economic development, forest resources growth, and capital investment have been promoted (Wang, 2006; Xu et al., 2009; Jiang et al., 2008; Liu and Wang, 2009; Zhang and Xu, 2009; Chen et al., 2008; Wang and Zhai, 2009). Zhang and Lü (2008) and Huang et al. (2008) suggest that farmers' willingness to invest in forestry is determined by the logging quota system, funding availability, forestry technology and amount of forest lands. Xie and Wen (2009) indicate that farmers who were reluctant in managing forest were willing to lease out their forests in Jiangxi Province. Zhang and Wen (2008) suggest that the reform plays a positive role in increasing farmers' income from forestry and improving their living standards. Consistent with Zhang and Wen (2008), Kong (2008) argues that the ongoing reforms play an important role in enhancing farmers'

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welfare. Guo (2008) points out that not only farmers will benefit from the reform, but also village committees, cooperatives, and forest product manufacturers.

While almost studies suggest that the recent reforms have enhanced individual control of forest property rights, and promoted forest management in general, the variation of different households in response to the same policy has not been investigated. The objective of this paper is to assess and quantify the variation of individual farmers' forest management behaviors in response to the recent reforms. The forest management behaviors were measured by participation and amount of investment (labor and capital inputs) in forest management. The household demographic characteristics, land resource factors, and economic circumstances are considered as influencing factors in the analysis.

The paper is structured as follows. The model specification and data collected are presented in Section 2. Data description and empirical results are presented in Section 3. Section 4 closes with discussion, conclusion and some policy implications.

2. Methodology

2.1. Model specification

To investigate farmers' forest management behavior in response to the reform, we classified them into those who invested (participants) and those who did not (non-participants), and then estimated the level of investment (amount of labor and capital inputs) in forest management activities by the participants. Farmers were assumed to maximize profits in their forest management (Cubbage et al., 2003; Zhang and Owiredu, 2007). Following earlier studies that suggest farmers' participation in forest management activities and investment intensity are influenced by social, economic, demographic and institutional variables (Mercer and Miller, 1998; Otsuka et al., 2001; Zhang and Flick, 2001; Pattanayak et al., 2003; Chen et al., 2008; Zhang and Wen, 2008; Wang and Zhai, 2009), we specified the following conceptual model:

$$Y_i = f_i(H, R, E, I), \quad i = 1, 2, 3$$

where

- Y1 whether or not a household participated in forest management, and if yes, how much was the amount of labor (Y2) and fund (Y3). It is noted that forest management consists of tree planting, cultivation and harvesting in this paper.
- H Household demographic characteristics;
- R Tenures of household land resources;
- E Household economic status (e.g., amount and sources of income);
- I Institutional variables (e.g., attitudes toward the reform).

Age and education of household head were used to describe the household demographic characteristics. Other demographic characteristics considered important and included in the model were: number of family members in school, and number of family labor force. Household land resources were categorized into croplands and forest lands. Income from off-farm and income from selling forest products are used to represent household economic status. We also considered householders' attitudes to the distribution of forest land, understanding on the logging quota system, and valuation on the reform to capture the impact of institutional factors. It must be noted that there are two kinds of measuring the institutional changes. Objectively they should be measured by the decision to the real policy changes took place. However, subjectively attitudes of farmers to the changes might be important as well as their decisions are very much dependent on the perceptions.

2.2. Study area and data collection

The study was conducted in Tonggu County, Jiangxi Province in southeast China (Fig. 1). Jiangxi Province was one of the four provinces to host pilot projects for the reforms of collective forest property rights in 2004. By 2007, Jiangxi had accomplished the main task of reform ahead of the other provinces. It was estimated that the per capita benefit from reform increased by 41% in 2005, and the rate of farmers' participation in forestry production was 42% (The Jiangxi Statistic Bureau, 2006). As one of the seven pilot counties of forestry reform and an important forestry county, Tonggu was the first to have gone through the collective forest property rights reform by the end of 2005.

According to a forest resources inventory organized by the local government in 2009, the county had 137,986 ha of forest land, covering 87% of the total land. State-owned forestlands shared 14% of the total forestland and the rest was collectively owned. The total standing forest stock was 8.83 million cubic meters, and the amount of bamboo sticks was about 49 million. On average, each person owns 1 ha forest land, but not more than 0.05 ha of crop land at the county level. Therefore, forest lands are crucial resources to the local households. As a result of the reform, about 93% of collective forests have been distributed to farmers, suggesting that a significant proportion of forest land usufruct and stumpage ownerships were transferred to the farmers. The local forestry administration had issued 26,835 forest tenure certificates among the 26,462 rural households by the end of 2005.

Tonggu County has 103 villages under 9 townships. Townships differ from one another in terms of distance to county center, status of forest resources and process of reform. In order to get a representative sample, this study sampled farmers in 13 villages from all 9 townships: 9 villages were randomly selected from each township; 3 villages with specific characteristics of technical and financial assistance from the local government and non-governmental organizations. Locations of these villages can be seen in Fig. 1.

We interviewed 341 heads of household from Jan 4 to 29 and from March 1 to 26 of 2010 through a 9-page questionnaire. Interviewees were selected randomly from a list of households provided by village committees with around 10% of total households in the selected villages. As questionnaires from 19 households were incomplete, the data from 322 households were used for the analysis. Data regarding forestland was taken from the forest property right certificates of the farmer. Thirteen workshops were organized with members of village committees regarding forest tenure reform and farmers' participation in forest management. Secondary data for general description of local socio-economy and forestry were collected from local forestry administration and Statistic Bureau at the county level.

The questionnaire used to collect primary data includes basic household demographic variables, land resources, off-farming activities, expenditure for production and livelihood, forest management and production, attitudes to the reform, and understanding the institutional arrangements in forestry. Detailed input–output data were also collected at household level. Household total income includes income from crops, livestock, timber, bamboo, some other non-timber forest products, and off-farm wages. Investment in forest management was measured by investment on planting, tending, thinning, and logging. A binary choice (*yes* or *no*) was used about attitudes toward the distribution of forest land, understanding on the logging quota system, and valuation on the reform. The primary data covered the entire year of 2009.

The survey was pre-tested in a randomly selected village during the first week of January 2010. Approximately one and a half hours was used to interview one household. Some compensation was paid