



Land tenure (in)security and crop-tree intercropping in rural Xinjiang, China



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ABSTRACT

The relationship between land tenure security and long-term land-related investment is of great importance especially given the current flux in property rights systems of agricultural land in China. This paper empirically examines the role of land tenure security in farmers' crop-tree intercropping decisions, and is based on a comparative analysis between contract land and wasteland holders in rural Xinjiang, China. Data from a survey, carried out in 2008 among 352 households in Awati County in Xinjiang, is used to estimate the factors that affect the adoption of crop-tree intercropping. The results indicate that, for those households that only have contract land, land tenure security positively affects their adoption of crop-tree intercropping. However, for those that hold both contract land and wasteland, land tenure security negatively impacts upon their adoption of crop-tree intercropping on wasteland, as the crop-tree intercropping on wasteland can increase the perceived tenure security of wasteland. The results also suggest that the comprehensive effect of labor organization on intercropping is moderate as a result of the presence of counteracting effects.

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1. Introduction

Crop-tree intercropping system, referring to the mixed cultivation of tree for wood/timber or fruit/nuts and annual crops in the same field, is widely practiced around the world and its popularity has increased since the late 1970s (Lacombe et al., 2009). As an alternative to traditional farming system, a crop-tree intercropping system is considered to increase land productivity and diversify production (Thevathasan and Gordon, 2004). This approach is seen as a sustainable agricultural practice, which brings significant ecological, agronomic and economic benefits (Mercer, 2004; Lee, 2005; Jerneck and Olsson, 2013). The local government in Xinjiang is promoting intercropping of crops and fruit trees in a large programme to improve the agricultural output of small farmers, most of whom are of Uyghur origin (Spoor et al., 2010). The other focus is to improve the ecological environment in this arid and semi-arid region by reversing the increasingly severe degradation of irrigation water and arable land.

Intercropping is considered as a long-term land investment which carries substantial risks about future outcomes, and also represents a lasting change of land use (Jerneck and Olsson, 2013). The adoption of intercropping systems involving trees is often

hindered by various constraints such as an unsupportive institutional environment and farm labour availability (Lee, 2005). There are many examples of low adoption rates and/or rapid abandonment after initial participation from many regions around the world (Pattanayak et al., 2003; Jerneck and Olsson, 2013). This phenomenon warrants further analysis into the factors that influence farmers' decisions to adopt agroforestry intercropping. Empirical results indicate that important determinants include demographics, resource endowments, geographical factors, and farmers' perceptions of risk-related factors, i.e., land tenure (in)security (Adesina et al., 2000; Neupane et al., 2002; Ndayambaje et al., 2013). Factors affecting farmers' adoption decision on agricultural innovation, however, are significantly location-specific (Lee, 2005). Understanding the precise relations between land tenure security and the adoption of these agroforestry practices may therefore contribute to a better implementation of policies to promote these technologies.

Although some empirical attention has been paid to the role of land tenure security in farmers' land investment/agricultural innovation practices (Montambault and Alavalapati, 2005; Nkamleu and Manyong, 2005), the existing studies in this field provide mixed evidence (Godoy, 1992; Adesina et al., 2000; Mercer, 2004; Tenge et al., 2011). For example, Tenge et al. (2011) demonstrate that insecure land tenure significantly reduces the likelihood of adopting a crop-tree intercropping system. This also reflects the findings of Godoy (1992) and Mercer (2004). Nkamleu and Manyong (2005), on

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the other hand, find that land tenure insecurity has a positive effect on farmers' adopting live fencing, and Adesina et al. (2000) note that farmers' adoption of alley farming is not significantly related to land tenure security. It is, then, of great interest to empirically investigate the factors that affect intercropping practices under specific land tenure systems.

In the context of China, various land reforms, in which peasants/farmers are provided with usufruct rights with different lease duration, do not create sufficient land tenure security (Brandt et al., 2004; Wang et al., 2011). Several studies have examined the assurance effect of land tenure security on land investment in China (Li et al., 2000; Jacoby et al., 2002; Feng et al., 2010; Xu et al., 2014). However, very limited empirical evidence can be found for the causal link between land tenure security and long-term investment in land in China. Exceptions are the analyses by Wen (1995) and Ma et al. (2013). The former reports that farmers' perception of land tenure insecurity caused by frequent land reallocation reduces their incentives for investment, and the latter shows that land leveling in northwest China is positively affected by land tenure security. Given the crucial role of land tenure security in the land use strategies of farmers, there is surprisingly little, if any, research undertaken on the precise linkages between land tenure (in)security and smallholders' decisions to adopt crop-tree intercropping (which represents a long-term land investment) in rural China.

In the case of rural Xinjiang, interestingly, farmers seem to be more likely to adopt tree-crop intercropping on wasteland rather than contract land, offering a useful insight in the role of land tenure security. This paper attempts to identify the determinants of adopting intercropping practices on contract land and wasteland, focusing particularly on the role of land tenure security from the long-term land investment perspective. The innovative aspect of our analysis is the distinction of two categories of land used by small farmers. Contract land was assigned following the implementation of the household responsibility system (HRS) in the 1970s, and farmers normally are issued with formal contracts or certificates of long duration. Wasteland refers to land converted from desert land which can be developed by farm households or local government. This is often rented for short period from the village committee through informal land allocation systems, and the use of the land needs to be pre-approved by the village committee (Spoon et al., 2010). These two land types represent two typical land tenure arrangements in rural Xinjiang, thus providing important comparative insights into the effects of land tenure (in)security on long-term land investment.

The remaining part of the paper is structured as follows. Section 2 discusses recent land tenure reforms in China and their consequences for land tenure (in)security, drawing a comparison of the two land tenure arrangements that are the focus of our study. This section also establishes an analytical framework for identifying the linkage between land tenure security and farmers' adopting intercropping, based on the literature review. Section 3 introduces the research site and data set, and is followed by the empirical estimations in Section 4, in which the variables are defined, the model specified and the estimation strategy are presented. Section 5 reports on the estimation results. The conclusions and some policy implications are drawn out in the final section.

2. Land tenure security and crop-tree intercropping decisions

2.1. Tenure security of contract land and wasteland

To have a clear understanding of the tenure security of contract land and wasteland, we first describe the recent land tenure

reforms that are relevant to these two land tenure arrangements. We discuss tenure security status within a tripartite framework based on Van Gelder (2010) and Ma et al. (2015). The former author initially proposed that land tenure security has three components: legal status, *de facto* status, and perceived tenure security. These three components were further qualified by Ma et al. (2015) in their investigation of the underlying causes of land tenure insecurity in rural China. However Ma et al.'s study (2015) did not focus on the role of informal tenure institutions on land tenure security. This section focuses on comparing tenure security status of contract land and wasteland in rural Xinjiang, paying special attentions to the role of informal institutions in shaping the perceived tenure security of wasteland.

2.1.1. Tenure security of contract land

Contract land is collectively owned and was allocated by the village committees to individual households under the HRS in the early 1980s. To strengthen tenure security of contract land, four major land relevant laws have been enacted since the late 1990s. These laws include the Land Management Law of 1998, the Rural Land Contract Law of 2002, the Property Law of 2007, and the Mediation and Arbitration of Rural Land Contract Disputes Law of 2009. They regulate various aspects of land tenure security, ranging from the issue of land certification, the extension of contract lengths, a prohibition on land reallocation, the encouragement of the right of transfer, and the provision of instruments to resolve land disputes. These laws contribute to a high level of land tenure security in a formal institutional framework (Deininger and Jin, 2006; Wang et al., 2011), but fail to provide farmers with actual security of tenure (Brandt et al., 2004; Deininger and Jin, 2009). This is mainly due to insufficient implementation of these laws in many regions. For example, formal land institutions do not prohibit land reallocation (Tan et al., 2006; Wang et al., 2011), and the governments do not issue land certificates to every household. The underlying causes include ambiguous nature of laws and rules for village level self-governance (Ho, 2001; Ma et al., 2015).

Insufficient implementation of the laws and regulations further contributes to farmers having stronger perceptions of less security of tenure. A survey conducted by Wang et al. (2011) shows that 60 percent of 2200 respondents do not believe in the role of government policies in stabilizing rural land tenure security. Another survey of 259 households from 21 villages in the Minle County, Guansu province also shows that 47 percent of farmers do not have confidence in the central government's efforts at stabilizing land tenure security (Ma et al., 2013). This is similar with the situation found in rural Nicaragua, where although local farmers are legally entitled to use their land, they perceive their land tenure status to be insecure due to the lack of enforcement and impartiality in addressing insecurities on formal institution (Broegaard, 2005). Land certificate is another important proxy of actual tenure security in China and is expected to improve perceived tenure security. However, surveys conducted in rural China show that while 80 percent of interviewed households in the Gansu research area that possess land certificates believe that land certificates are important for protecting land rights, only 58 percent of the households possessing a land certificate in the Jiangxi case hold a similar belief (Ma et al., 2015).

2.1.2. Tenure security of wasteland

Due to the provision of technology and subsidies, construction of irrigation facilities, and population growth (and influx of migrants) in Xinjiang, large areas of wasteland have been converted for agricultural production (Spoon et al., 2012). Wasteland is exploited either by individuals or by the local government (the township government and the village committee). It is estimated that around

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