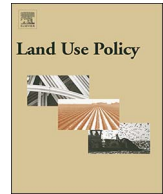




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Varieties of agri-environmental schemes in China: A quantitative assessment

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ABSTRACT

Agri-environmental schemes have become an effective policy measure to prompt farmers to protect rural farmland and landscapes. In recent years, 17 provincial governments including Sichuan, Jiangsu, Shanghai, Guangxi and Guangdong have shown increasing interest in promoting local experimentation with agri-environmental schemes. Based on two waves of farmer survey data in Eastern, Middle and Western China conducted in 2012 and 2015, this paper conducts a comparative study of three agricultural environmental policy models: the farmland protection fund model in Chengdu city (the Chengdu model), the farmland eco-compensation model in Suzhou city (the Suzhou model), and the conventional farmland protection model in Wuhan (the Wuhan model). Our quantitative analyses show that: agri-environmental schemes in China have significantly enhanced farmer enthusiasm toward farmland protection and lifted their policy satisfaction. Yet, the improvement in farmer knowledge of farmland ecological functions is limited; different agri-environmental models have diverse policy effects. Overall, the Chengdu model characterized by a combination of pension insurance and agricultural insurance benefits works better than the Suzhou model. Farmer participation in rural farmland and landscape protection is affected by multiple factors, among which education is the most significant.

1. Introduction

In the past three decades, agri-environmental schemes (AESs) featuring economic compensation for environmental goods have been considered an effective policy innovation to incentivize farmers to participate in the protection of fertile farmland and the rural landscape in the Western world and more recently in developing countries. In a typical AES model, farmers voluntarily sign management contracts to receive necessary technological support and financial assistance. For instance, the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA), both affiliated with the U.S. Department of Agriculture (USDA), presently govern around twenty programs and subprograms, including the Environmental Quality Incentives Program (EQIP), the Wetlands Reserve Program (WRP), the Conservation Reserve Program (CRP), the Farm and Ranch Lands Protection Program (FRLPP), and so forth. These programs directly and indirectly compensate and assist producers and landowners who are willing to practice conservation on agricultural lands to achieve the goals of reducing soil erosion, drinking water protection, protecting wildlife habitat, and so on (Garrod and Wilson, 2004; Stubbs, 2015). The schemes have been found to greatly improve farmland quality, preserve biodiversity, protect farmland cultural functions, reduce poverty, and improve social welfare (Pagiola et al., 2005; Soini and Aakkula, 2007; Bulte et al.,

2008; Van Rensburg et al., 2009; Miller et al., 2010). Given the significant development of AESs in the developed and developing countries, more and more academic attention has been devoted to studying the behaviors of farmers in AESs, whose decisions to participate is essential for the success of the schemes (Falconer, 2000; Wilson and Hart, 2000). By analyzing what factors may influence farmer participation, we will be able to further encourage farmers to be involved in order to improve farmland quality and to preserve the rural landscape.

The existing literature has studied farmer participation and regional differences in AESs from micro, meso and macro perspectives. The micro perspective focuses on farmer individual characteristics such as age, education, health, marriage status, and psychological expectations, among others (Wilson, 1996, 1997; Willock et al., 1999; Austin et al., 2001; Hounsome et al., 2006; Murphy et al., 2014; Stroman and Kreuter, 2016) and farmer family conditions including family income, agricultural income, and employment (Defrancesco et al., 2008; Lynne and Rola, 1988; Murphy et al., 2014; Quillérou et al., 2011; Van Rensburg et al., 2009; Wilson, 1997; Zbinden and Lee, 2005). For instance, the study by Zbinden and Lee (2005) shows that participation in Costa Rica's PES (Payments for Environmental Services) program is significantly influenced by farm size, household economic factors, and information variables measured by access to extension resources and meetings attended. Based on a farm level analysis, we are able to grasp

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more insights into the motivations for participation among rural residents.

The meso perspective aims to analyze the relationship between farmers participation decisions on the one hand and the scale, type, and geographic characteristics of their farms on the other (Wilson, 1997; Wilson and Hart, 2000; Morris et al., 2000; Kleijn et al., 2004; Zbinden and Lee, 2005; Hounsome et al., 2006; Concepción et al., 2008; Defrancesco et al., 2008; Van Rensburg et al., 2009; Espinosa-Goded et al., 2010; Gocht et al., 2013; Raggi et al., 2015; Gailhard et al., 2015). In addition, some scholars are interested in exploring the effects of regional culture on farmer participation in AESs (Morrison and Hardy, 2016). For example, Kline and Wichelns's (1994) comparative study of Rhode Island and Pennsylvania reveals that regions with more economic growth, greater population increase, and higher real estate values tend to enjoy more support for the PDR (Purchase of Development Rights) programs than other regions.

The third perspective is the macro one of state policy (Purvis et al., 1989; Wilson, 1997; Espinosa-Goded et al., 2010; Ma et al., 2012; Sutherland et al., 2013; Van Rensburg et al., 2009; Villanueva et al., 2015). A good example here is the comparative study conducted by Wilson and Hart (2000) of farmer motivations for joining AESs in ten European countries. Their research shows that the differences in farmer participation or nonparticipation are affected by the timing of national agricultural protection policies in each country. The three perspectives mentioned above have advanced our understanding of farmer participation in AESs. Yet, they have two shortcomings. First, few studies have analyzed farmer participation in a longitudinal manner with the exception of a limited amount of research (Arriagada et al., 2012; Lastra-Bravo et al., 2015; Raggi et al., 2015). In addition, the existing scholarship has not paid sufficient attention to developing country cases. To overcome these problems, this paper studies the case of China, where dozens of cities have engaged in AES experiments in a longitudinal fashion.

The local State-led AESs in China have attracted great attention although most of the programs are not yet mature. Building upon the literature on farmland protection in China (Lichtenberg and Ding, 2008; Li et al., 2014; Xiao et al., 2017), we aim to contribute to this body of work by using survey data that assess the implementation effects of varieties of agri-environmental schemes in China. In the meantime, we intend to explore what factors may influence the performance of these policies and farmer participation. By analyzing farmer survey data from Chengdu, Suzhou, and Wuhan in 2012 and 2015, we argue that AESs in China have significantly enhanced farmer enthusiasm toward farmland protection and improved their policy satisfaction. Their effects of improving farmer knowledge of farmland ecological functions, however, are limited. Different agri-environmental models have diverse policy effects. Farmer participation in rural farmland and landscape protection is affected by multiple factors, among which education is the most

significant.

The paper will proceed as follows. The second section will introduce the development of AESs in China. In the third section, a description of the study sites, data sources, and methodological approach is provided. The fourth section, the empirical part of this paper, will quantitatively evaluate the heterogeneous effects of AESs and the influencing factors of farmer participation in AESs. The next section is our discussion of research results. The last section is the conclusions.

2. Agri-environmental schemes in China

It is well known that China uses 9% of the world's arable land to feed 21% of its population. What is less familiar to people is that when China experienced explosive population growth from 1979 to the mid-1990s, it had also lost over 14.5 million hectares of arable land for various reasons. In light of this severe threat to food security, the central government of China took a series of mandatory measures to protect farmland, among which several important regulations and institutions stood out, such as Dynamic Equilibrium of Gross Arable Land, Land Use Regulation, and Regulations on the Protection of Prime Farmland, and so forth. These governmental policies overwhelmingly emphasized farmers responsibilities while neglecting their land development rights. As a consequence, farmland protection performance still significantly lagged behind the government's expected goals. So it became imperative to adopt incentive-based programs to stimulate farmer interest in farmland protection. Against this backdrop, agri-environmental schemes were gradually adopted as governmental public policies in rural China.

Drawing lessons from successful programs overseas, China officially began to reform farmland protection systems by promoting AESs in 2008. For example, by releasing the No. 1 Central Document at the beginning of 2008, a government document similar to the Farm Bill in America, for the first time ever, the central government announced that it would "draw boundaries for permanent prime farmland and establish protection-compensation mechanisms". Provisions enacted in subsequent No. 1 Central Documents in 2009, 2010, 2012, 2013, 2014, 2015, 2016 reflect the government's continued support for improving AESs. Influenced by the State's policies, some major cities such as Chengdu, Suzhou, Dongguan, Shanghai, Foshan, Guangzhou, Linhai, Haining, and Cixi, among others, have vigorously conducted their AES policy experiments. Among all local State-led AES initiatives, two successful models emerged: Chengdu's farmland protection fund program and Suzhou's farmland eco-compensation program. These two models are different in terms of payment standards, implementation methods, fund resources, and so forth (see Table 1). Yet they have both played a positive role in terms of encouraging local farmland protection. To better assess the policy effects of AESs in China, we add Wuhan city, a major grain production site which has not adopted any AES program, as

Table 1
AESs in Chengdu and Suzhou.

Program	Farmland protection fund (Chengdu)	Farmland eco-compensation (Suzhou)
Participants	Farmland users ^a and their communities	Farmland users
Eligibility	All types of farmland in Chengdu	Prime farmland in Suzhou
Starting date	January, 2008	January, 2010
Incentives	(i) Payment based on farmland quality. Prime farmland: payment is 6000 RMB per hectare per year; general farmland ^b : payment is 4500 RMB per hectare per year. (ii) 10% of payments are used for land transfer guarantee funds and agricultural insurance within the region, the other 90% of payments are used for pension insurance for local farmers.	(i) Payment based on farmland quality, location and scale. Payment for prime farmland is 3000 RMB per hectare per year where the area is between 66.667 and 666.667 hm ² , and 6000 RMB per hectare per year where the area is above 666.667 hm ² . (ii) Participants get the entire cash payment.
Fund sources	Funds mainly come from land sales, compensation fees from newly-added construction land, and taxes on farmland used for nonagricultural purposes.	Funds mainly come from local finance, land sales, special subsidies from upper-level government, social donation, and so forth.

^a Farmland users in China refers to farmers who are officially endowed with rights of contracting rural farmland and their communities.

^b General farmland refers to agricultural production land except for prime farmland.

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