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Support policy preferences of for-profit pest control firms in China

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ABSTRACT

This study surveyed 297 for-profit pest control firms (FPCFs) in Huang-Huai-Hai Plain, China. After processing the information on neglected attributes, the heterogeneous preferences of FPCFs for different support policies were investigated using the choice experiment method, mixed logit model (MLM), and latent class model. Findings indicated an optimal model fit validity, which applies the inferred attribute non-attendance method to process information. The estimation results of the hierarchical Bayes MLM effectively reflected the preferences of FPCFs. FPCFs are heterogeneous in their preferences for different support policies and prefer those with technical and credit support and agricultural subsidies (the mean coefficients of those attributes are greater than 0.8). When faced with the same combination of policy attributes, FPCFs with highly educated operators, high service efficiency, numerous large-scale machineries, and abundant funds are likely to expand their service area. Furthermore, FPCFs could be classified according to different preferences, namely, finance (47.1%), technology (21.6%), security (18.7%), and information preference (12.6%).

1. Introduction

Agricultural service is a significant measure for promoting the development of modern agriculture and improving its output efficiency (Rosa et al., 2017). Accordingly, agricultural service providers are important because they offer agricultural services. Therefore, government support policy is necessary for the agricultural service provider to perform its role (Gao et al., 2017a).

The Chinese government integrates international experience and "local characteristics" to form support policies including financial and technical support, tax incentives, and publicity (Lu, 2016). More than 1 million for-profit and 152,000 non-profit agricultural service providers are covered by the current support policy[1] in China (Chen, 2014). Despite the progress achieved by all types of agricultural service providers in terms of quantity and scale (Luo et al., 2016), they still face some general problems, such as low service efficiency, uneven service areas, and mismatched service contents. Thus, the supply capacity of agricultural service providers cannot meet the diverse needs of various agricultural producers (Li et al., 2015). Therefore, self-service is common among family farms, but it is costly and can wasteful of resources (Gao et al., 2017b).

The lack of supply capacity of agricultural service providers in China is attributed to a top-down agricultural support policy mode (Peng and Shi, 2016). Government-formulated support policies fail to adequately reflect the preference and acceptance of different support policies among agricultural service providers. Thus, incentive effect is difficult to provide to agricultural service providers. By contrast, as the policy demand side and as a direct beneficiary of policy implementation, agricultural service providers participate in the selection and formulation of support policies that will effectively enhance the satisfaction of policy implementation, thereby effectively upgrading the supply capability of agricultural service providers.

Many crop production processes, such as crop planting and storage, are threatened by pests. Hence, a pest control service is an important component of an agricultural service system (Midega

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[1] For-profit agricultural service providers refer to professional service firms, which pursue profit, whereas non-profit agricultural service providers are government and public institutions that provide public welfare and non-exclusive services.

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et al., 2016). Xiao et al. (2017) pointed out that the reduction rate of chemical pesticide application per mu (1 mu = 0.067 hm^2) is approximately 10%–20%, even 30%, in the adoption of pest control services among Chinese family farms. Compared with non-profit pest control firms, profitability and development potential are substantial in for-profit pest control firms (FPCFs) due to their strong service capacity (Shtaltovna, 2016). Furthermore, many uncertain risks, such as bad weather and sudden invasion of diseases and pests, increase the operating costs of FPCFs and affect their service effects, resulting in the income loss of farmers who are being served. Currently, the farmers who are served often refuse to pay service fees, which lead FPCFs into a business predicament (Wang and Li, 2016). Therefore, Brewer et al. (2012) and Ragasa and Golan (2014) reported that the government should support FPCFs with agricultural subsidies and with credit and insurance support.

The present study takes 297 FPCFs in Huang-Huai-Hai Plain as its sample, uses choice experiment, focuses on attribute non-attendance (AN-A), and adopts mixed logit model (MLM) and latent class model (LCM) in revealing the heterogeneous preference of support policies for FPCFs.

2. Literature review

2.1. Support policies for agricultural service providers

The agricultural service system, with its diverse forms of services such as comprehensive service contents, diversified service subjects, and coordinated and efficient operations, is established in industrialized countries under government support (Obiora, 2014). The main support policies of industrialized countries can be summarized as: US model, which mainly supports agricultural service providers to improve service efficiency and to meet market demands by improving relevant laws and regulations (Haitham and Hurani, 1995); Japan model, in which agricultural service providers can receive direct subsidies to purchase equipment and apply for loans (Mulgan, 2016); Germany model, which supports agricultural service providers through financial support and tax relief policies (Guinnane, 2001); Canada model that provides technical support and skills training service to support agricultural service providers (Smyth et al., 2011); France model, which supports agricultural service providers through policies such as agricultural subsidies, tax incentives, credit support, and skills training service (Triboulet, 2015). However, support policies for agricultural service providers should be differentiated based on agricultural development levels and regulations across countries (Wairimu et al., 2016). Therefore, the applicability of various support policies is yet to be studied and tested in China.

In recent years, Chinese scholars have carried out a wide spectrum of studies on support policies for agricultural service providers in China's context but based on lessons from foreign support policies. For example, Kong et al. (2012) argued that the government should strengthen the construction of qualified personnel in agricultural service providers by improving the education and training system. Tong and Hou (2015) pointed out that the government should take agricultural service providers as the key financial support subject of agricultural investment. According to Lu and Zhou (2014), a favorable environment should be created to develop for-profit agricultural service providers by facilitating promotion, credit facilities, and insurance. Agricultural service providers such as information, machinery, and pest control services' correspond to different agricultural production stages, and their support policies may differ. However, most existing studies in China have generalized that the agricultural service providers of different production stages result in lack of pertinence of the proposed supportive policies. In addition, the existing research in China has focused on the formation stage of suggestion and has lacked in-depth discussion on the support policy preferences of agricultural service providers; thus, the feasibility of research results remains to be tested.

2.2. Policy preferences based on choice experiment

Choice experiment method has been widely used in non-spot agricultural pollution control (Han and Yang, 2010), agri-environmental schemes (Ruto and Garrod, 2009; Villanueva et al., 2015), agri-environmental subsidy schemes (Christensen et al., 2011), “greening” common agricultural policy (Schulz et al., 2014), conservation agriculture (Ward et al., 2016), and livestock pollution control policies (Pan et al., 2016). However, this method should still be improved with further research.

Choice experiment assumes that respondents are rational and prefer policy attributes. However, respondents often behave irrationally in actual situations, thereby ignoring a few attributes and causing an AN-A problem that can lead to a biased estimation of standard deviation. Therefore, Hensher (2007) pointed out that the information ignored by respondents should be processed to reduce estimation bias. The traditional information processing method is the stated AN-A method, which directly inquired whether the respondents ignored attributes during decision-making. If the respondent ignores attributes, then the attribute is 0 because it does not enter the utility function of the respondent. However, the follow-up study found that some FPCFs pretended to ignore an attribute but did not completely ignore it (Carlsson et al., 2010). The aforementioned AN-A method should promote the development of inferred AN-A, which identifies various information processing strategies as a certain probability (Scarpa et al., 2013). Hess and Hensher (2010) showed an optimal model fit validity, which applies the inferred AN-A method to process information.

In addition, Maximum Likelihood Estimation (MLE) is the most common method used to estimate the attribute variable coefficient in MLM and LCM. However, this method is computationally complex and lacks accuracy (Edwards and Allenby, 2003). Compared with MLE, the hierarchical Bayesian estimation method overcomes the erratic optimal solutions caused by different initial points by directly evaluating the likelihood function (McCulloch and Rossi, 1994). Meanwhile, the hierarchical Bayesian estimation could obtain improved parameter estimation but with a few constraints (Byun and Lee, 2017). Although the robustness of the inferred AN-A and the hierarchical Bayesian estimation have been confirmed by the data from some countries, the empirical tests based on Chinese data have remained scarce.

3. Experimental design and statistical description

3.1. Attribute and level settings

The determination of policy attributes and their state levels is the prerequisite for constructing selection situation and improving the effectiveness of choice experiment design. We initially identified policy attributes and status levels according to existing literature and policies. The choice experiment questionnaire was then formulated to include a pre-survey on FPCFs. Furthermore, we conducted consultation and discussion with nine experts (five of