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PATTERN AND MECHANISM OF INNOVATION DIFFUSION IN AGRICULTURAL SOCIALIZED SERVICE: EVIDENCE FROM CHINA

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ABSTRACT

With the prompt development of agricultural modernization, new or improved agricultural socialized services are emerging continuously in the form of service innovations. The effective innovation diffusion of new or improved agricultural socialized services promotes the connection between small farmers and modern agriculture. However, studies rarely focus on the diffusion patterns or mechanism of agricultural socialized service innovation. Even the classic theory of technological innovation diffusion does not answer the research question. This paper adopts the semi-structured interview to investigate the relevant stakeholders of agricultural socialized service innovation, including small farmers, governments, service providers, etc. The grounded theory is adopted to analyze first- and second-hand data. The results indicate four types of diffusion patterns of agricultural socialized service innovation, including government-led top-down diffusion, service providers-farmers bilateral diffusion, intra-farmer diffusion, and government-service providers collaborative diffusion. The diffusion mechanism of agricultural socialized service innovation is analyzed from the perspective of farmers. The results show that the diffusion of agricultural socialized service innovation contains three stages following the “stimulus-organism-response” (SOR) framework i.e., cognition of service, persuasion based on comparison and confirmation of needs. Relevant factors affect the diffusion process. In the cognition stage, service attributes, and personal characteristics and needs affect farmers’ initial cognition of agricultural socialized service innovation. In the persuasion stage, compatibility, opinion leaders and community communication affect farmers’ opinions of the value of agricultural socialized service innovation. In the confirmation stage, farmers make decisions influenced by perceived risk, trust and value. The research results enrich the theory of innovation diffusion in the context of agricultural socialized service, and inspire the effective promotion and application of agricultural socialized service innovation.

Keywords: *Agricultural socialized services, innovation diffusion, service innovation, diffusion pattern, diffusion mechanism.*

INTRODUCTION

Building the connection between smallholder farmers and modern agriculture is key to rural revitalization and an important component of agricultural modernization (Zheng *et al.*, 2022). The perfect agricultural social service system is an important symbol of agricultural modernization. Agricultural socialized services have reshaped the smallholder agricultural system and promoted scale operations in rural China (Wang *et al.*, 2023). Agricultural socialized services refer to various agricultural production services provided by business entities directly engaged in agricultural production, including pre-production services (e.g., agricultural materials supply), mid-production services (e.g., farming technical support), and post-production services (e.g., agricultural product sales) (Wang *et al.*, 2023).

China's rural areas are facing a shortage of labor and capital, and many farmer households choose to outsource some agricultural production to address their lack of labor (Deng *et al.*, 2020). Agricultural socialized services play a crucial role not only in increasing grain production but also in enhancing the overall efficiency and sustainability of agricultural practices (Wu *et al.*, 2024). Relying on its professional and technical personnel, green production materials, low cost and market competitive advantages, agricultural socialized services can alleviate the problems of high risk, high cost and insufficient technical management ability faced by individual farmers in technology adoption (Hao *et al.*, 2018).

Existing literature on agricultural socialized service primarily focuses on specific cases or production stages such as pre-production, mid-production and post-production. However, few studies systematically address the diffusion path, model, and mechanism of agricultural socialized service innovation, considering the influencing factors throughout the entire diffusion process, from generation to adoption.

This paper uses grounded theory to explore the patterns and mechanisms of agricultural socialized service innovation diffusion, and clarifies the general principles of the diffusion process. The research findings enrich the theory of innovation diffusion and its application, enhance the quality and implementation of agricultural socialized service, and promote the modernization of the agricultural socialized service industry.

MATERIAL AND METHODS

The data were collected primarily through interviews and analyzed based on the grounded theory. To ensure data triangulation, data were collected from multiple information sources, including interviews, observations, artifacts, literature and archives. A wide range of supplementary materials, including annual reports, publications, presentations and news-items, were collected from public sources.

A diverse set of observation guidelines and interview questions was developed to thoroughly investigate the processes, managerial elements and success factors of innovation in agricultural socialized service. The interviewees included farmers, service providers, and government officials from 41 cities across 13 provinces. A

total of 234 interview transcripts were accumulated from agricultural organizations, relevant enterprises and government departments.

RESULTS AND DISCUSSION

Diffusion patterns of agricultural socialized service innovation

Based on the data, four types of diffusion patterns for agricultural socialized service innovation are identified (Table 1, Figure 2), including government-led top-down diffusion, service providers-farmers bilateral diffusion, intra-farmer diffusion, and government-service providers collaborative diffusion:

(1) Government-led top-down diffusion. The central government leads, local governments supervise, and grassroots farmers learn and implement, forming a three-level linkage.

(2) Service providers-farmers bilateral diffusion. This mode involves a two-step process. First, service providers demonstrate their advantages and attract farmers to adopt agricultural social service innovation projects. Second, farmers actively seek innovations from service providers.

(3) Intra-farmer diffusion. This mode relies on the dissemination of promotional materials and the sharing of information, occurring in two approaches. The first approach involves bidirectional diffusion between large agricultural households and agricultural retail investors. The second approach occurs between smallholder farmers.

(4) Government-service providers' collaborative diffusion: Agro-related enterprises participate in innovative research and development, and local governments promote these innovations to positively influence farmers' cognition and willingness to adopt them.

Table 1. Coding results of diffusion patterns

Selective coding	Axial coding	Open coding	Representative evidence from the interviews
Government-led top-down diffusion	Collaboration at all levels of government	Government leadership	Innovative agriculture depends on government
		Grassroots publicity	Door-to-door visits by village committees
Service providers-farmers bilateral diffusion	Driven by service providers	Big households lead the way	Large growers and cooperatives drive
		Expert guidance	Technical experts provide guidance
Intra-farmer diffusion	Imitation among peasant groups	Herd mentality	Pass one by one
		Word of mouth	Spontaneous communication among ordinary people

Government-service providers collaborative diffusion	Interaction between government and business	Cooperation between government and enterprise	Government publicity
		Demonstration base	Typical demonstration

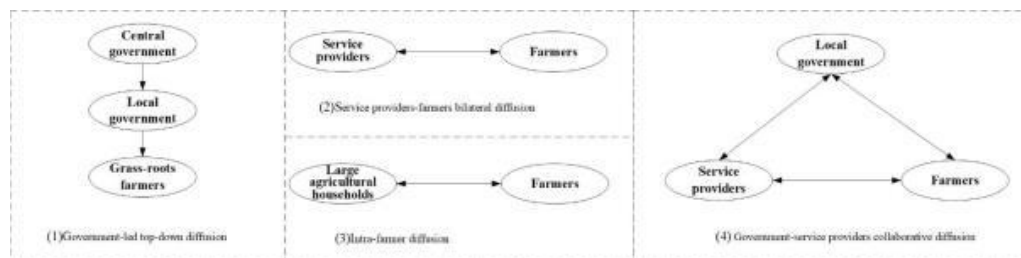


Figure 1. Diffusion patterns of agricultural socialized service innovation

Diffusion mechanism of agricultural socialized service innovation

From the farmers’ perspective, the innovation diffusion mechanism of agricultural socialized services consists of three stages: cognition – persuasion and confirmation (Figure 2). By considering the interplay of nine elements, needs, service attributes, personal characteristics, compatibility, opinion leaders, community communication, risk, value, and trust – a complete chain of agricultural social service innovation diffusion has been formed (Table 2). Farmers’ initial cognition of agricultural socialized service innovation is influenced by practical needs, existing problems and technological updates. Farmers’ interview reflected their needs for income and efficiency and highlighted that despite the iteration and advancement of agricultural production technologies, issues related to natural conditions remain, such as barren land and complex terrain. Farmers hope that social service innovation in agriculture can help them achieve higher returns, increase efficiency and improve quality while adapting to the natural endowments and social conditions of different regions. Service attributes are decomposed into dimensions such as quality, price, and attitude. Farmers’ personal characteristics, including age, education background, quantity and other dimensions, play a significant role in their cognition regarding agricultural socialized service innovation. Farmers obtain relevant information about these innovations through the various media channels, and then process the information based on their actual conditions. For example, “through various meetings, documents, training courses, on-site meetings, etc.” With a good attitude, low price and good quality service innovation, it is easier to promote positive cognition among younger and higher-educated farmers. Farmers’ initial cognition is followed by the persuasion stage. In this stage, compatibility serves as an antecedence, Opinion leaders and community communication act as mediators, and farmers’ willingness to adopt is the outcome. The inherent factors such as farmers’ traditional production habits, planting conditions and cultural concepts may not fully align with the level of some

agricultural socialized service innovation. The compatibility between these factors and innovations is crucial for persuasion. Traditional agricultural production habits and concepts can cause farmers' resistance to agricultural socialized service innovation. Farmers need to understand the benefits and effects of agricultural socialized service innovation through authoritative groups and actual cases before accepting innovative services to replace traditional methods. As one farmer noted, "We are very concerned about building agricultural infrastructure to increase agricultural income." Infrastructure construction and new technologies can enhance production efficiency and secure income. During the persuasion process, opinion leaders significantly influence farmers, and the information dissemination through community social networks further promotes farmers' adoption willingness. Service providers contribute by raining technical experts, deploying these experts to rural areas to address farmers' issues, and spreading new ideas about agricultural production. When farmers are persuaded and form a willingness to adopt, they proceed to re-confirm the innovation of agricultural social services. During the confirmation phase, risk measurement serves as an antecedence, perceived trust and perceived value are the mediators, and farmers' adoption behavior is the outcome. Adoption cost, partners and related service subsidies are important indicators affecting farmers' risk measurement, with economic risk being the most important factor affecting farmers' adoption behavior. In the trade-off process, farmers evaluate the perceived value and trust in agricultural socialized service innovation through promotional efforts of various channels such as the government, service providers and large agricultural households. Factors such as government credibility and service provider reputation are carefully considered by farmers. If farmers finally perceive that the value outweighs the risk, they will adopt or trial the agricultural socialized service, deciding on full adoption based on the trial's results. For the above three stages, demonstrating successful field cases and establishing contracts to mitigate farmers' economic risks, while maximizing benefits and minimizing harm, are effective measures to encourage adoption.

Table 2. Coding results of diffusion mechanism

Selective coding	Axial coding	Open coding	Representative evidence from the interviews
Cognition of service	Need	Demand	Reduce the intensity of labor
		Problem	The infrastructure of agriculture is poor
		Technology	Mobile client
	Service attributes	Attitude	Sincere service attitude
		Price	Free service
		Quality	High-quality seeds
	Personal characteristics	Age	30 to 50 years old
		Number	Lack of labor force
		Education	Low educational level

Selective coding	Axial coding	Open coding	Representative evidence from the interviews
Persuasion based on comparison	Compatibility	Habit	Production and living habits of farmers
		Planting	The planting area is not large
		Thought	Train farmers to accept new ideas
	Opinion leaders	Cooperative	Co-op leadership
		Government	The government organizes training courses
		Conference	Village assembly
	Community communication	Online	Use big data for publicity
		Expert	Professional technical guidance
		Offline	Face-to-face communication
Confirmation of needs	Risk	Cost	Reduce labor costs
		Partner	Cooperation with Jilin Agricultural University
		Profit	Large investment in agriculture affects slowly
	Value	Economy	Increase farmers' income.
		Ecology	Improving the rural environment
		Subsidy	Special funds as support
	Trust	Government credibility	The company follows the national policy
		Case credibility	Demonstration base
		Supplier reputation	Good reputation in the industry

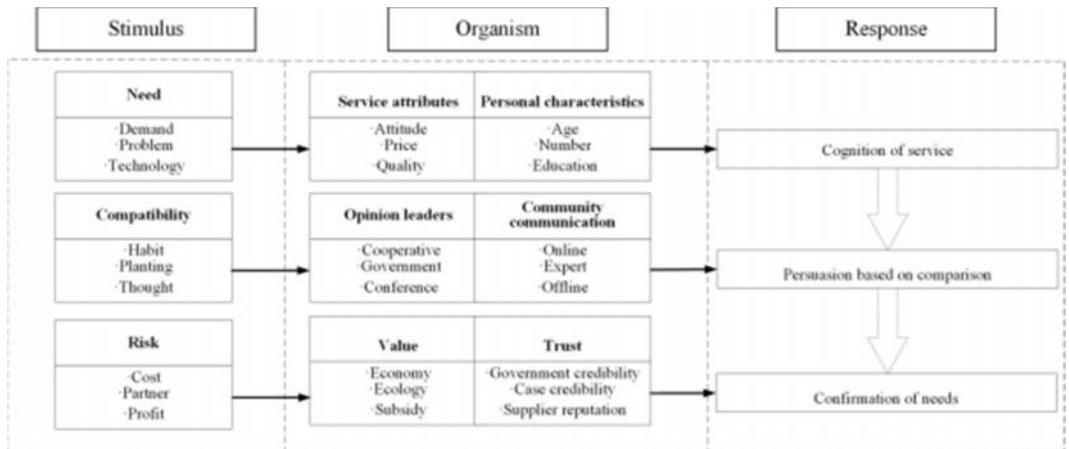


Figure 2. Diffusion mechanism of agricultural socialized service innovation

CONCLUSIONS

The innovation of agricultural social service can be summarized into four diffusion patterns:

- (1) Government-led top-down diffusion: A one-way diffusion from the government to farmers, characterized by high trust from farmers but lacking targeted services.
- (2) Service providers-farmers bilateral diffusion: A two-way diffusion between socialized agricultural service providers and farmers, encompassing service innovations provided by the providers and those actively sought by farmers based on their needs and trust.
- (3) Intra-farmer diffusion: Communication and publicity among farmers, representing the most common and practical mode of innovation diffusion, and relying on interpersonal relationships and inter-group imitation behavior.
- (4) Government-service providers collaborative diffusion: Diffusion from government departments to agricultural socialized service providers, and then to farmers. This model combines government credibility with the professionalism of agricultural service providers, and is easily accepted by farmers.

Social agricultural service innovation spreads through three stages: cognition, persuasion, and confirmation. From the farmers' perspective, these stages progress sequentially through different combinations of nine elements: innovation need, service attribute, personal trait, compatibility, opinion leader, community communication, risk measurement, perceived value, and perceived trust. These elements constitute the entire process from farmers' understanding of the service to its adoption. Innovation needs, service attributes and personal characteristics affect farmers' initial cognition of agricultural socialized service innovation. Compatibility, opinion leaders and community communication are crucial in the persuasion stage, where farmers are persuaded to accept the innovation through demonstration bases, and online and offline exchanges. In the confirmation stage, farmers evaluate perceived trust, value and risk to decide whether to accept the services based on trial outcomes.

This paper identifies the innovation diffusion patterns and mechanism for agricultural socialized service, as well as the interplay of multiple influencing factors within the innovation diffusion mechanism, and further deepens the exploration of the innovation diffusion path in the field of agricultural socialized service.

Based on the conclusions of this paper, the following suggestions are proposed. First, the government should improve the rural financial investment mechanism and increase subsidies. Second, efforts should be made to enhance the promotion of agricultural socialized services. Third, attention should be paid to farmers' ideas and communication.

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