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# What Drives Smallholders to Utilize Socialized Agricultural Services for Farmland Scale Management? Insights from the Perspective of Collective Action

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**Abstract:** The diseconomies of scale found in smallholders' agricultural production is a common problem faced by global agricultural development. Notable examples of regions in which this occurs include Central and Eastern Europe, India, Brazil, and China. Smallholders usually differ in their demands for socialized agricultural services due to scattered farmland, various soil conditions, different selections of crop varieties, and diverse farming arrangements. Such differences make it difficult for smallholders to cooperate on farmland scale management, resulting in a collective action dilemma. Based on the Institutional Analysis and Development framework, this paper provides insights into the influencing factors and effects of smallholders' utilization of socialized agricultural services and constructs a cooperative mechanism for the purpose of solving the collective action dilemma in rural areas of China. We found that household characteristics, biophysical conditions, attributes of community, and rules-in-use jointly generate the action situation in the process of smallholders' cooperative utilization of agricultural socialized services. Among them, the rules-in-use not only have a direct impact on the action situation but also regulate the role of the other three sets of factors. Various factors and mechanisms affecting the cooperative utilization of socialized agricultural services by smallholders interact in the action arena and finally form relevant outcomes that can deal with the diseconomies of farmland fragmentation. These outcomes will be fed back to each external variable again along the feedback path, so as to promote the system and create a virtuous circle. This study provides a theoretical contribution to understanding smallholders' cooperation in the process of agricultural large-scale operation, especially in regions and countries with a large number of smallholders.

**Keywords:** smallholder; socialized agricultural services; farmland scale management; collective action dilemma; institutional analysis and development (IAD) framework

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## 1. Introduction

According to the International Fund for Agricultural Development, there are about 500 million smallholder farms worldwide, which support the food supply of about 2 billion people globally and 80% of the food consumption in Asia and Sub-Saharan Africa [1]. In addition, 73.6% of farms are smaller than 1 ha, and in 81 countries, 84.8% are smaller than 2 ha (covering two-thirds of the world's population and 38% of the world's arable land), according to the Food and Agriculture Organization of the United Nations [2]. From the perspective of regional distribution of smallholders, the degree of small-scale agricultural operation is particularly serious in Asia, among which the proportion of farm area smaller

than 1 ha in China is up to more than 90%, followed by India at nearly 65%. The average level of other Asian countries is around 60%. In addition, Africa also has a large number of smallholders, among which the proportion of farm areas smaller than 1 ha is as high as approximately 55%. In Europe, the farms with an operation area smaller than 1 ha account for about 30%, and farms smaller than 2 ha account for about 50%. Comparatively, North America, Oceania, and other regions have a relatively large scale of farming operations, and the proportion of farms with an operating area of more than 5 ha is more than 50% [2]. In general, affected by factors such as resource endowment, economic development, and population size, the scale of farmers' operation in developed countries is usually large, while it is mainly small in developing countries.

There are two completely different viewpoints on smallholder agriculture: The first viewpoint holds that there is advantage for smallholder agriculture that is mainly based on the agricultural intensification [3]. In the mountainous or hilly areas, it is a better choice to carry out the agricultural production by smallholders in order to improve the output per unit area because smallholders adopt the refined production mode [4]. However, the second viewpoint is that smallholder agriculture has more disadvantages. Especially, from the perspective of economies of scale, smallholder agriculture excludes the cooperation between families and cannot achieve the large-scale aggregation of means of production [5]. To this end, a number of countries have taken many measures to promote the long-term development of smallholders. For example, the Japanese government strongly supports agricultural associations [6]; South Korea has initiated land system reform based on private land ownership [7]; the Netherlands focuses on the development of specialized agricultural cooperatives [8]; and India has carried out a green revolution with government support [9]. Based on their own national and agricultural conditions, each country has come out with a path that is suitable for the effective connection between smallholder and modern agricultural development.

It can be improved through land-tenure transfer to promote farmland scale management, which has become a popular practice worldwide [10–12]. In fact, large-scale farmland operations are restricted by many factors: First, the high land-tenure transfer cost and unstable transfer period pose a large and long-term risk to grain and to other low-value-added bulk agricultural products [13]. Second, the farmland scale management resulting from the transfer of land management rights among smallholders may show the characteristics of decentralized scale; that is, tenure-transferred farmland may be scattered into different parcels of land although the transfer-in of farmland tenure helps to increase the total area of smallholders' farmlands. This will partially hinder the large-scale application of various means of agricultural production [14]. What can be done to mitigate the disadvantages of smallholders and promote their development in a way that is compatible with modern agriculture? As much rural labor force is moving to cities, and the population aging has been increasing in recent years, policy makers are constantly seeking ways to solve these problems. They have found that socialized agricultural services have become an effective way to do so [15–17]. Socialized agricultural services refer to the provision of high-quality, efficient, and comprehensive public welfare services and operational services for agriculture production, and the main suppliers are usually the public welfare institutions established by the government, rural cooperative organizations, private enterprises, etc. [18]. Compared with land-tenure transfer, it can avoid adverse factors such as a high transfer cost and an uncertain transfer period [19].

The development of the agricultural service industry in the United States, Japan, and other agriculturally developed countries in the world began in the 1860s. Until the 1950s, the agricultural production mode of these countries gradually changed from self-sufficient to commercial and from traditional manual labor to semi-mechanization. By the early 21st century, microelectronics, software, and information technology had been gradually applied to agricultural production, seedling breeding, planting management, marketing services, and other fields. Since the beginning of the 21st century, booming agricultural services have gradually penetrated all aspects of the agricultural industry [20–23].

China experienced a development trend of socialized agricultural services similar to that of other countries in the world: agricultural production was dominated by smallholders before 1977, when several households usually shared farming animals, a labor force, and other agricultural capital for production in order to have lower production costs and higher income. In this stage, the mutual assistance of farmers was based on trust, a small scale, temporariness, and deficient stability [24]. From 1978 to 1999, as China saw rapid economic development, many farmers transferred from the agricultural industry to secondary and tertiary industries. Most of them alternated farming in busy seasons with working in cities in slack seasons, and the mode of part-time management gradually formed in agricultural production. A large number of farmers chose to purchase mechanized agricultural services to reduce the opportunity cost of their alternation between farming in rural areas and working in the city: in 1999, 66.6% of the wheat in China was reaped by combine harvesters, and nearly 70% of wheat sowing was outsourced [25]. Since 2000, China's socialized agricultural services have gradually become market oriented. In particular, the cancellation of agricultural tax in 2006 has motivated farmers to purchase socialized agricultural services. Land entrusted to individuals, joint tillage and planting, and land trusteeship have been continuously popular strategies in agricultural management [26]. As of the end of 2020, about 900,000 socialized agricultural service suppliers in China had provided services for over 107 million hectares of farmland, of which 60 million was for grain crops [27].

However, China is different from other agriculturally developed countries in the world in terms of the development background of socialized agricultural services. In the United States, agricultural management is represented by large private farms with the characteristics of high modernization, formalization, regionalization, and specialization, and socialized agricultural services are dominated by technical services. The agricultural operation in Japan, characterized by fine production, involves agricultural associations providing comprehensive agricultural services. China differs greatly from other countries: There are a large number of farmers, with 207 million farmers having contracted cultivated land. In 2019, only 5% of the total number of farmers in China managed more than two hectares of land, with the per capita farmland area managed by rural families standing at only 0.26 hectares [27].

Socialized agricultural services are a solution to the production problems faced by global smallholders, i.e., the original purpose of socialized agricultural services is to provide business services for smallholders. However, in the actual operation of socialized agricultural services, many smallholders are actually unable to participate in socialized agricultural services, which inhibit the role of socialized agricultural services. Especially for China at present, the reform of the rural land system is steadily underway, but farmers only have the right to use arable land and have no right to own it, so it is impossible to realize the free sales of arable land in the short term. With the continuous flow of rural laborers to cities, China has adopted the separation of "three rights" (farmland ownership, farmland contracting right, and farmland operation right). The implementation of the separation of three rights has greatly endowed smallholders with more property rights that increased their property income [28], especially dealt with the disadvantage of farmland fragmentation and improved the farmland output rate, resource utilization rate, and labor productivity [29]. However, if we simply expand the scale of farmland, it cannot be ensured that the capital, technology, entrepreneurial ability, and other related factors will match the farmland scale expansion. The benefits of farmland scale expansion may be offset, resulting in the phenomenon of a diseconomy of scale. Therefore, socialized agricultural services can be chosen to achieve large-scale agricultural operation.

However, the characteristics of a large country with many smallholders in China result in the collective action dilemma in the development of socialized agricultural services. For example, in actual production, different smallholders depend on agriculture differently, the quantity and quality of the family labor force are complicated, the land cannot be consolidated centrally due to natural resource conditions, smallholders have diverse choices of crop varieties, and the growth cycle of various crops is different. Therefore, smallholders

have to pay more for socialized agricultural services, and service providers gradually supply less services to smallholders. Finally, smallholders will have no access to these services, and the scattered farmland of smallholders does not allow for farmland scale management through them.

In fact, this results from government intervention, coupled with market development: First, the current policies on socialized agricultural services give priority to large-scale farmers, such as professional large-scale farmers and family farms that dominate these services. Second, the market has gradually excluded scattered smallholders. Large-scale farmers, characterized by formalization and intensification, are more suitable than smallholders for the market supply of socialized agricultural services. Therefore, encouraging smallholders to break through the collective action dilemma in self-organized ways has become the key to concentrating scattered smallholders for farmland scale management (see Figure 1).

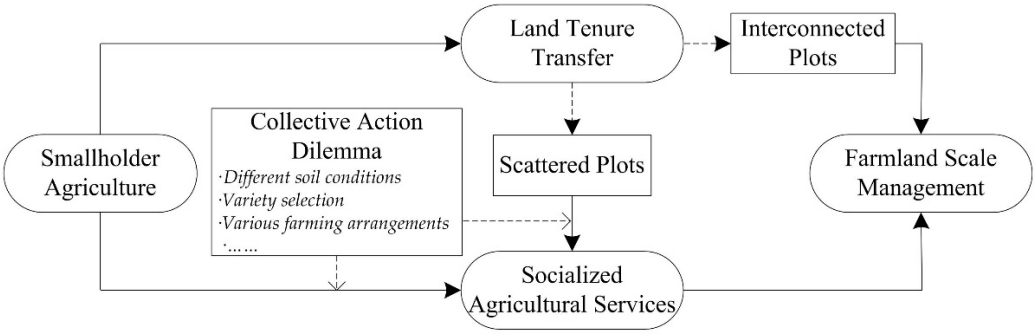


**Figure 1.** Logic of smallholder agriculture, collective action, socialized agricultural services, and farmland scale management.

In terms of the relationship between large-scale and small-scale farmers, previous studies believe that the land-tenure transfer campaign has helped large-scale farmers expand and smallholders decline. This is reflected in the inconsistent demand for and supply of socialized agricultural services; what is clearly manifested is the extrusion and disintegration of smallholders by the system of socialized agricultural services [30]. In general, the demands for socialized agricultural services of large-scale agricultural farmers are more in line with the market supply due to the concentrated large-scale farmland, the high requirements for efficiency and cost control, and a strong demand for new technologies [31–33]. Smallholders are excluded from the market to some extent and need slight and scattered socialized agricultural services [34–36]. Therefore, in a system of socialized agricultural services centered on large-scale farmers, the large scale of cultivated land combined with socialized agricultural services makes the agricultural production of smallholders more difficult. A free-rider phenomenon has appeared in the process of agricultural production. For example, when large-scale farmers utilize socialized agricultural services, such as infrastructure construction, sales, and information supply, smallholders can obtain certain benefits for free.

Among smallholders, there are essential differences in productivity, production mode, and business purposes. Smallholders, who usually own many parcels of farmland with different areas, for example, differ in their demands for socialized agricultural services due to different soil conditions, variety selection, and farming arrangements [37–39]. Such differences make it difficult for them to coexist and cooperate in limited space, resulting in the Prisoner's Dilemma: When one of the peasants with two plots adjacent to each other chooses to use socialized agricultural services and the other peasant does not, the socialized service provider will usually charge a higher price for a plot with a smaller area. Finally, both sides have to adopt the traditional method of agricultural production. If both choose to use socialized agricultural services, the economies of scale of the plots can reduce the price of socialized agricultural services and greatly improve the efficiency of agricultural production through the collective action. Therefore, a set of standards of rules, mutual benefit models or supervision, and restraint mechanisms are needed to enhance

mutual trust, improve their cooperation ability, and break through the collective action dilemma [40].

Therefore, it is significant to construct the driving mechanism of smallholders' utilization of socialized agricultural services, so as to explain the logic of smallholders' collective action. First, in terms of theoretical contribution, it enriches the theory of international collective action. Focusing on the mechanism of smallholders' cooperative utilization of socialized agricultural services, we use the IAD framework to carry out systematic diagnosis of complex public governance mechanisms, further expand the connotation of diversity and complexity of the mechanism of smallholders' cooperative utilization of socialized agricultural services, and contribute a new Chinese case to the theory of collective action. Second, in terms of practical contribution, it provides a new idea for agricultural development for other countries with lots of smallholders. Although the development background of China's socialized agricultural services is different from other countries, there are a lot of similarities, such as serious farmland fragmentation and the majority of smallholders. By analyzing the mechanism of participating in socialized agricultural services from the perspective of self-governance of smallholders, the discovered mechanism could be of great significance for other countries to promote the formulation of policies for the development of socialized agricultural services.

## 2. Framework and Methodology

### *2.1. Framework*

The IAD framework is used to analyze collective action [41]. In 2005, Ostrom systematically introduced the IAD framework in her book *Understanding Institutional Diversity*, and analyzed its role in solving the collective action dilemma. The IAD framework can help to identify the factors and relationships in collective action and is a common language for theoretical and empirical research in the social sciences, especially in the field of institutional analysis. The basic function of the IAD framework is to help researchers analyze how participants interact with each other, according to external variables under specific action scenarios, to generate specific incentives and interaction patterns that lead to certain outcomes, and researchers can then objectively assess those outcomes. The IAD framework provides a structural method to study the collective action logic of participants in different environments. The important contribution of the IAD framework is that it organizes the main variables existing in various situations. The IAD framework contains external variables, an action arena, interactions, evaluative criteria, and outcomes. The action arena in the center of the framework refers to the social space where individual participants interact, exchange goods and services, solve problems, dominate each other, or come into conflict. The action arena includes action situations and participants, with the former the core part of the framework. Ostrom argues that the structure of a specific action situation is determined by different combined external variables [42]. Under the IAD framework, the researcher analyzes, in specific action situations, how participants interact according to external variables, generate specific incentive and interaction modes, achieve specific outcomes, and objectively evaluate outcomes. In the original IAD framework, Ostrom divided external variables into three categories: biophysical conditions, attributes of community, and rules-in-use. The agricultural production of smallholders is closely related to cultivated land, and institutional factors can affect the decisions of smallholders to use socialized agricultural services from the aspects of incentives and constraints. Thus, it is necessary to consider biophysical conditions and rules-in-use as important factors in our analysis. The attributes of community mainly affect smallholders' behavior from the aspects of community characteristics, such as the size and the degree of development. More importantly, attributes of community can be used to analyze smallholders' behavior from the aspect of homogeneity or heterogeneity among all smallholders. Therefore, this paper extracts the household characteristics from the attributes of community as a separate category in order to focus on the analysis of homogeneity or heterogeneity among smallholders.

Based on the adapted IAD framework as shown in Figure 2, this paper analyzes the logic of smallholders' utilization of socialized agricultural services.

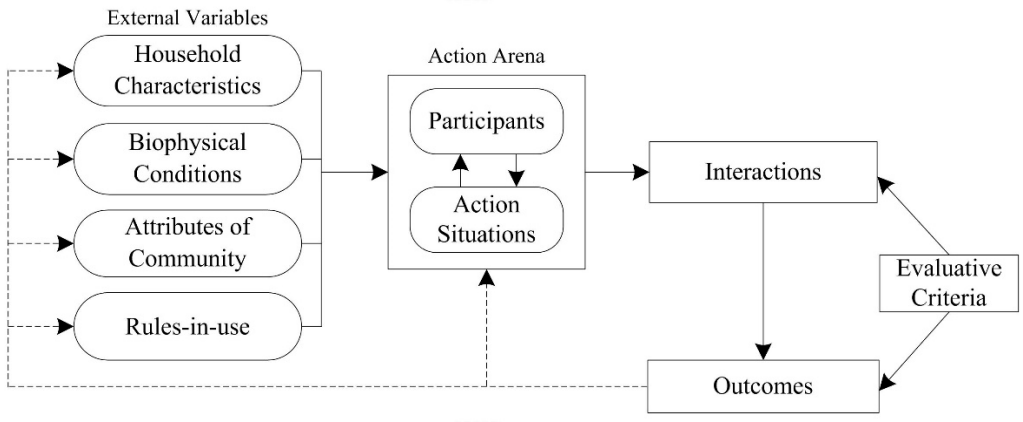


**Figure 2.** Institutional analysis and development framework.

### *2.2. Methodology*

In our analysis, we utilized the citation index databases, such as Web of Science, CNKI, Elsevier, Springer, ScienceDirect, for literature retrieval. The key words, such as smallholder, small scale farmer, socialized agricultural services, farmland scale management, collective action, influencing factor and land tenure transfer, were selected according to our research purpose. In order to reflect the effectiveness for a given period of time of the research results, we mainly selected the literature that was published since 2012. Finally, considering the quality of journals, we mainly selected the journals published in SSCI, SCI, CSSCI, CSCD, and finally obtained 120 articles for analysis.

On the whole, the selected literature has the following characteristics: First, from the perspective of countries, the study on socialized agricultural services mainly focuses on China, and there are also a few studies on Indonesia, Ecuador, Japan, the Netherlands, Bangladesh, and Spain. Second, from the perspective of the research method, most of the analyses were conducted by quantitative analysis, which can directly reflect the relationship between variables that affect smallholders' participation in socialized agricultural services; only a few studies focus on a case study. Third, from the perspective of time context, the earlier literature on smallholders' participation in agricultural socialized services was mainly theoretical and conceptual analyses, and more and more researchers began to conduct the analysis focusing on specific factors recently, such as physical factors.

## 3. Factors Influencing the Utilization of Socialized Agricultural Services in Cooperation with Smallholders

Existing studies have confirmed that quite a few factors can affect smallholders' decisions to utilize socialized agricultural services [43]. From a macro perspective, Kassem noted that the factors influencing their decision to utilize socialized agricultural services include availability, accessibility, diversity, relevance, and effectiveness [44]. Specifically, the confirmed factors include farmers' age [45], gender [46], educational background [47], and income [48], the added value of the agricultural products [49], agricultural information sources [50], and so on. Based on the IAD framework, this paper divides the factors into four categories: household characteristics, biophysical conditions, attributes of community, and rules-in-use. The paper describes the specific factors contained in each category through literature reviews.

### *3.1. Household Characteristics*

#### 3.1.1. Household Labor Force

Amid urbanization and industrialization, the disadvantage of a comparative benefit of agriculture promotes the continuous migration of the rural labor force to nonagricultural

sectors in urban areas, resulting in a fall in the quantity and quality of the agricultural labor force. Regarding hollow villages, socialized agricultural services have been found to ease shortages in the agricultural labor force [51]. For example, Yamauchi studied farms in Indonesia and found that, for large-scale farms, a shortage of labor will help farmers rent machinery, thereby improving agricultural production efficiency [52]. In this context, a smaller family labor force has become a major factor in driving smallholders' willingness to utilize socialized agricultural services [53]. In terms of the impact of changes in the family labor force on the utilization of socialized agricultural services, a smaller family labor force will significantly increase the socialized agricultural services in seedling transplanting, fertilization, and pesticide spraying in agricultural production, because these links entail certain skills, and the operation quality directly affects the agricultural output. After analyzing 1174 smallholders in the Jiangsu Province of China, it was found that the impact of household labor force on these three agricultural production processes showed a negative effect at the level of 10% [54].

#### 3.1.2. Household Financial Status

Whether smallholders choose to purchase socialized agricultural services is affected by financial factors. Zhang, for example, noted that smallholders' willingness relies on the lowest opportunity cost, the average use cost of agricultural machinery with different power, the service price, and other variables [55]. The literature shows that smallholders are mainly affected by family income and price sensitivity.

(1) Family Income

In a free competitive market environment, the market demand for socialized agricultural services, a kind of tradable service, is affected by the family income of smallholders. Raes conducted a sampling survey on farmers in Ecuador and found that income has an impact on smallholders' contract choice [56]. The impact of family income on the cooperative utilization of socialized agricultural services is mainly because family income determines the ability to purchase such services [57]. Because smallholders have less arable land, socialized agricultural service providers usually ask for higher service prices and eventually exclude smallholders with low family income. If the family income of smallholders is high, they may be willing to pay a higher price for agricultural socialized services, and their willingness to cooperate with other peasants may be reduced. On the contrary, if the family income of smallholders is low, they may purchase socialized agricultural services through cooperation with other families. Based on the data of 3082 households in the Jiangxi and Guangdong provinces of China, the impact of family income on the cooperative utilization of agricultural socialized services by smallholders was significant at the level of 10% in both land acquisition and harvesting after *probit* and *ivprobit* analysis [58].

(2) Price Sensitivity

The sensitivity of smallholders to the price of socialized agricultural services is an important factor determining the decision to utilize socialized agricultural services [59]. Generally speaking, the higher the price of socialized agricultural services, the less frequently smallholders use such services. Especially when socialized services are much more expensive than traditional agricultural production, socialized services will no longer be the best choice for agricultural production [60].

Therefore, the primary problem to be solved is to reduce the purchase cost if smallholders choose to use socialized agricultural services for production [61]. Previous studies show that joining agricultural cooperatives can reduce costs. In the initial stage of agricultural production, smallholders who need to reduce the operation costs of agricultural machinery usually join cooperatives for unified management, with household-contracted farmland as equity. They eventually obtain the benefits from economies of scale through socialized agricultural services [62].

In agricultural production, the sensitivity of smallholders to the price of socialized agricultural services also varies from pre- and mid-production to post-production. In terms of the research on socialized agricultural services in Hengyang, Hunan, China, Chen noted

that smallholders with small areas of cultivated land are more sensitive to the price of socialized agricultural services. All links in agricultural production are generally completed by family labor in order to save cost; therefore, smallholders have fewer demands for socialized agricultural services in mid-production than in pre- and post-production [59]. In detail, price significantly inhibits the utilization of socialized services in farmland preparation and harvesting because, in labor-intensive production, socialized agricultural services meet the general law of demand price theory—that is, the rise in service costs will prevent farmers from adopting services. In technology-intensive production processes, such as rice transplanting, fertilization, and pesticide applications, the service cost does not significantly affect farmers' utilization of agricultural services because services by different providers mean different results—that is, pricing determines the service quality. Li's research on Jiangsu found that the sensitivity of smallholders to socialized agricultural services costs showed a negative effect at the levels of 1% and 5%, respectively, in farmland preparation and harvesting [54].

Due to smallholders' sensitivity to change, as well as service providers of different types, smallholders make different choices about socialized agricultural services between profit-making and nonprofit organizations: In terms of the agricultural material supply, agricultural product trading, and capital lending, smallholders prefer profit-making organizations. In terms of pest control and crop reaping, however, they tend to choose nonprofit organizations [59]. The reason lies in the cost of different types of socialized agricultural services: The prices of pest control and crop harvesting, as the basic links of agricultural production, are usually low, as they are the basic services provided by nonprofit organizations supported by the government. In terms of the supply of agricultural materials, agricultural product trading, and capital lending, smallholders will eventually choose, from many kinds of products of vastly different prices, affordable services provided by profit-making organizations, according to their needs.

#### 3.1.3. Risk Preference

Risk preference determines whether smallholders choose to utilize socialized agricultural services [63]. Vassalos confirmed that the risk aversion of smallholders significantly affects their choice of contracts [64]. Overall, the lower the degree of risk preference, the greater the possibility of smallholders signing a contract and purchasing socialized services. This is mainly because signing contracts that are more in line with the reasoning of both trading parties can enhance the trust of both parties and lead to a consensus on a transaction, which helps to prevent opportunistic behaviors and moral hazards. Therefore, in order to avoid higher risks, smallholders with a low risk preference are more likely to avoid risks by signing contracts. Luo analyzed 2172 smallholders in Henan and found that risk preference had a significant impact on the utilization of socialized agricultural services at the level of 1% [65]. This explains why the decision to use socialized agricultural services is consistent with the tendency towards risk evasion in smallholders with a low risk preference [66]. For smallholders whose farmland plots are adjacent to each other, the difference in risk preference determines whether the smallholder can cooperate and utilize socialized agricultural services, since smallholders have different risk preferences for each type of socialized agricultural service, and there are many types of services. If there are great differences in risk preferences among smallholders, it is difficult to reach a consensus on a specific agricultural socialized service transaction, which reduces the possibility of cooperation.

In terms of specific agricultural production, smallholders with different risk preferences make different choices about socialized agricultural services. In rice production in Jiangsu, for example, smallholders with a low risk preference prefer to reduce socialized services in high-risk seedling transplanting, fertilization, and pesticide applications, but do not reduce the adoption of services in land preparation and harvesting [54]. This is because transplanting, fertilization, and spraying, as technology-intensive production methods, entail high production technology, and the emergence rate of transplanting and

the effect of fertilization and spraying will directly affect rice yield. Farmland preparation and harvesting, falling under labor-intensive production, however, require considerable labor and are completed mainly with the help of agricultural machinery. In these two areas, whether smallholders are less worried about production risks does not determine whether they adopt socialized services. On the whole, the lower the risk preference of smallholders, the more inclined they are to reduce the utilization of socialized services in high-risk, technology-intensive areas, resulting in a structural imbalance in the utilization of agricultural production services [67].

#### 3.1.4. Part-Time Farmers

Kimura pointed out that the gap between agricultural income and non-agricultural income is gradually widening, which will seriously affect the specific demand of smallholders for agricultural production services [68]. Generally, the more part-time work smallholders are engaged in, the more socialized services they will purchase, because the essence of part-time production is smallholders' pursuit of maximizing income [69]. In part-time peasant households, the sources of income consist of agricultural and nonagricultural income. As rational brokers, smallholders will improve resource endowment to make decisions between agricultural and nonagricultural production: When the marginal income in nonagricultural sectors is higher than that in the agricultural sector, smallholders will maximize their family income by giving priority to the allocation of the family labor force in higher-benefit nonagricultural work. With the transfer of the rural labor force generated by employment in nonagricultural sectors, there must be a shortage in the labor force in agricultural production, and the more part-time smallholders there are, the more serious the shortage in the agricultural labor force. When smallholders have to bear high costs for agricultural machinery, it is necessary to substitute the agricultural household labor force with socialized agricultural services [70].

In different production areas, whether smallholders work part-time determines their choices to use different types of socialized services. Being a part-time smallholder has a significantly positive impact on the decision to utilize socialized services in labor-intensive farmland preparation and harvesting, because smallholders usually first reduce the labor input in low-risk production [54].

In addition, the location of smallholders' nonagricultural jobs also determines to some extent whether they purchase socialized agricultural services or not. Smallholders working part-time outside their township can promote the use of socialized services more significantly than within the township. That is, the farther they have to travel to work in nonagricultural sectors, the more socialized agricultural services smallholders tend to adopt. Using the data of 1174 smallholders, Li found that, in the above two production processes, the impact of employment location was significant at the level of 1% [54].

However, some studies hold that smallholders, often working part-time, use fewer socialized agricultural services and do not have the motivation to use such services. This is because smallholders depending less on agricultural income may reduce their investment in agricultural production. Based on an analysis of 564 smallholders in Northeast China, it was found that the impact of being a part-time farmer on the decision to utilize socialized agricultural services showed a negative effect at the level of 1% [70].

### *3.2. Biophysical Conditions*

#### 3.2.1. Farmland Size

From the perspective of large-scale farmers and smallholders, professional farmers with large-scale farmland have a stronger demand for socialized agricultural services [32,71,72]. For example, Massayo pointed out that farmland size in Japan and the Netherlands has an appreciable impact on the decision to utilize socialized agricultural services [73]. Therefore, the utilization of socialized agricultural services by large-scale farmers often causes smallholders to engage in free-riding behavior, which eventually often leads to a situation where smallholders do not need to utilize socialized services in cooperation to reduce agricultural

production costs. The main reason for this is that farmers with large-scale farmland pay more attention to the cost-saving and efficiency-increasing effects of socialized agricultural services, while smallholders pay more attention to the effect on yield. In fact, free riding can effectively meet the needs of smallholders. Using the data of 378 households in Heilongjiang, it was found that the impact of farmland size on the use of socialized agricultural services was significant at the level of 5% [33].

From the perspective of the relationship among smallholders, it is often difficult for smallholders to reach an agreement in the process of utilizing socialized agricultural services. One reason for this is that the agricultural production of smallholders is diverse. Smallholders have heterogeneous demands for socialized services in all aspects of production. For example, due to different crop choices, smallholders' demands for socialized services in the purchase of agricultural materials, land-tenure circulation, labor employment, and other aspects are quite different, which makes it difficult for them to reach an agreement in the process of purchasing socialized agricultural services [74].

#### 3.2.2. Farmland Fragmentation

Generally speaking, there is a significantly negative correlation between the degree of farmland fragmentation and the decision of smallholders to use socialized agricultural services. The first reason is that farmland fragmentation reduces the efficiency of agricultural machinery operation. The higher the degree of farmland fragmentation, the lower the efficiency of agricultural machinery operation. As a result, organizations providing socialized agricultural machinery services are not willing to serve small plots of land alone. Based on the analysis of 328 households in Jiangsu, it was found that the number of plots affected agricultural production efficiency at the significance level of 1%; thus, reducing the utilization of socialized agricultural services [75]. Second, farmland fragmentation increases the cost of obtaining information. The more fragmented the cultivated land, the more scattered the plots of land are, which increases the difference in agricultural production endowments among plots [76]. Third, farmland fragmentation naturally reduces agricultural disasters to some extent and reduces the willingness of farmers to invest in agricultural insurance [77]. Fourth, the fragmentation of cultivated land increases the claim costs. If the parcels of land suffer losses from disasters, farmers will face complex claim settlement procedures and higher claim settlement costs for scattered plots. This explains why farmers reduce their demand for socialized agricultural services such as agricultural insurance [78].

#### 3.2.3. Land-Tenure Transfer

(1) Size of Transferred-in Land

Among academic circles, there is a common view that, with the transfer-in of land tenure to smallholders, the expansion of farmland size will increase their utilization of socialized agricultural services. Some studies, however, think that the positive effect of farmland expansion caused by land-tenure transfer-in on farmers' utilization of socialized agricultural services [79] is overestimated—that is, simple land-tenure transfer does not significantly affect smallholders' utilization of socialized agricultural services. If it helps with large-scale agricultural production, land-tenure transfer can significantly affect farmers' decisions.

Therefore, the impact of the transfer-in of the land-tenure on farmers' utilization of agricultural services is decided by the mode of transfer-in: Continuous plots of land-tenure transfer-in, as well as the simultaneous business scale and plot size expansion, will significantly improve the investment of smallholders in socialized agricultural services. Decentralized land-tenure transfer-in, with the deepening of land fragmentation and the reduction in plot sizes during the expansion of land management, will inhibit the positive effect of management expansion on smallholders' investment in socialized agricultural services [35].

(2) Land-Tenure Transfer Period

Scholars generally believe that the land-tenure transfer period has a significantly positive impact on facilitating smallholders to use socialized agricultural services, especially in terms of information services, infrastructure, processing, and sales. Based on the data of 445 households in the Jianghan Plain of China, it was found that the land-tenure transfer period has the greatest impact on the demand for socialized agricultural services, namely, agricultural information services and marketing services, both at the level of 1% [80]. This is because the longer the land-tenure transfer period is, the more stable future agricultural production appears to be to smallholders. That is why smallholders are more willing to invest in information services to standardize their agricultural production and to improve the natural environment with stronger infrastructure construction. In this way, the sustainability of production and operation can be enhanced [10]. In addition, the longer the land-tenure transfer period is, the more willing smallholders, when in a predictable, stable agricultural business environment, may be to further extend the agricultural production chain by strengthening postproduction services such as processing and sales, so as to obtain more surpluses.

(3) Land-Tenure Transfer Price

The land-tenure transfer price has a two-way effect on smallholders' use of socialized agricultural services [80]. In terms of loans, high prices of land-tenure transfer help generate the demand of smallholders for agricultural production loans. This is because high land-tenure transfer prices increase the total costs, and agricultural producers need the support of agricultural loans to ease the relative shortage of production funds caused by high land-tenure transfer prices. In terms of demand for technical services, information services, infrastructure, agricultural insurance, and other socialized agricultural services, a high land-tenure transfer price weakens the demand of smallholders for these services because it entails a high agricultural production cost. This high cost will pose great production pressures on farmers, which inhibit their investments in these socialized services [11]. After analyzing the sample data of 4301 households in Bangladesh, Das found that land rent will have a great impact on smallholders' investment in agricultural production, and the impact mechanism is mainly expressed by the impact of the farmland-tenure transfer price on the investment in other aspects of agricultural production [81].

#### 3.2.4. Farmland Quality

In general, the more fertile and the more uneven the cultivated land, the more likely smallholders are to adopt outsourcing services in production [82]. This is because the fertility of the cultivated land is in proportion to the expectation of smallholders for output. The more willing they are to invest in the land, the more likely they are to adopt outsourcing services to ensure production and improve efficiency. The unevenness of the cultivated land is proportional to the difficulty of completing production independently. This strengthens smallholders' need to use outsourcing services for production.

#### 3.2.5. Distance from Village to Township

Previous studies show that the distance from the village to the township can affect smallholders' collective action to utilize the agricultural services. The distance from the village to the township is proportional to the probability of smallholders using agricultural mechanization services in harvesting because low-paid rural households far away from the township are unable to purchase expensive harvesting machinery. They usually prefer to use social services for agricultural harvesting to improve agricultural productivity. Chen's research on Jiangxi and Guangdong showed that the effect of distance from the village to the township on agricultural harvesting services was significant at the level of 1% [58].

#### 3.2.6. Topography

The topography of the local villages is also an important factor affecting smallholders' utilization of socialized agricultural services [83]. According to previous studies, in mountainous or hilly villages, smallholders use fewer socialized agricultural services in

land preparation because such a topography inhibits the application of agricultural machinery [58]. Although smallholders have a demand for socialized services, the terrain decreases the accessibility of agricultural machinery with respect to the field and renders the operation of agricultural machinery less convenient [84].

### *3.3. Attributes of Community*

#### 3.3.1. Regional Differences

Because the geographical location, climate, landforms, and farming system vary from region to region, smallholders' needs for socialized agricultural services differ in different regions [84]. Based on the survey data of 1121 farmer households in 10 provinces in China, Li and Jiang's research shows that fewer smallholders use agricultural socialized services in Southern China than in Northern China. This is because, for smallholders, the opportunity cost of operating agriculture in the south is higher than that in the north, and their agricultural operation income accounts for a low part of the family income. The fact that there are more farmers engaged in large-scale agricultural production in Northern China increases the use of socialized agricultural services [85].

#### 3.3.2. Economic Development

Some scholars believe that regional economic development has a significantly positive impact on the decision of smallholders to use socialized agricultural services. The higher the level of regional economic development is, the more opportunities there are for employment in nonagricultural sectors, and the higher the family income of smallholders is. Therefore, smallholders in areas with a higher economic development level have a more urgent demand for socialized agricultural services [58]. For example, Zhong, Huang, and Li noted that promoting the development of the rural tourism industry can significantly increase rural tourism income and thereby increase the use of socialized agricultural services in that area. They pointed out that the impact of tourism income was significant at the level of 5% based on the analysis of the data of 2497 villages in Beijing. The internal logic is that the development of the rural tourism industry has transformed the endowment structure of labor and capital. When a family labor force moves from agricultural production to tourism, socialized agricultural services are needed to solve the labor shortage in agricultural production. The gradual gathering of capital in tourism will improve the overall income of smallholders who invest in agricultural production through socialized agricultural services. Thus, a mechanism is formed, as follows: capital → rural tourism development → income increase of smallholders → use of socialized agricultural services [86].

On the contrary, some scholars believe that smallholders in economically developed areas have a lower demand for socialized agricultural services, because most smallholders in wealthy areas are engaged in agricultural production that involves the entire industrial chain, such as production, processing, and sales, and some are themselves main providers of socialized agricultural services [87].

In general, the level of economic development will not only have a direct impact on whether smallholders utilize socialized agricultural services, but also be dominated by other factors, which will jointly affect the decisions of smallholders. The production of smallholders is closely related to cultivated land. Therefore, many factors related to physical conditions will affect the level of agricultural economic development. For example, the expansion of the scale of cultivated land, the reduction in the degree of farmland fragmentation, the increase in the scale of farmland transfer, the improvement in farmland quality, and other factors will become important in promoting economic development. In addition, changes in institutional rules have also had an impact on the level of economic development, such as the implementation of farmland registration and certification, the improvement in the agricultural production organization system, and the implementation of the smallholders' agricultural production incentive system. These systems will effectively promote regional agricultural economic development and subsequently affect smallholders' decisions to utilize socialized agricultural services.

#### 3.3.3. Employment Cost

As the regional economic development represents the level of employment cost to some extent, employment cost also affects the decision of smallholders to use agricultural socialized services [88]. Take farmland preparation and harvesting in agricultural production, for example: the increase in agricultural labor costs helps capital to replace labor and encourages smallholders to invest in land preparation machinery with lower prices; therefore, the demand for socialized agricultural services in land preparation decreases. Chen found that the impact of employment cost is significant at the level of 10% based on an econometric analysis of data from Jiangxi and Guangdong households [58]. Gianessi believes that employment cost is an important driving force for international agricultural outsourcing services, and that a higher wage in the United States will promote the subcontracting of organic agriculture with more labor demand to other countries; thus, reducing production costs [89].

#### 3.3.4. Credibility

The credibility of socialized agricultural service providers is an important factor affecting the decision of smallholders to use of socialized agricultural services. In China, for example, smallholders mainly obtain agricultural technology services from the government and its affiliated institutions, complemented by agricultural cooperatives, market-oriented science and technology intermediaries or service institutions, and agricultural enterprises [90]. There are two reasons for this: First, the trust of smallholders in the government helps to strengthen their dependence on government agencies that provide agricultural technical services. Second, agricultural cooperatives, agriculture-related enterprises, and other new agricultural service providers are still in the primary stage of development in general, and it is difficult to transform a deficient service supply in the short term [85].

As socialized agricultural services boom, smallholders choose more socialized agricultural services provided by agricultural cooperatives, science and technology demonstration households, market-oriented science and technology intermediaries or service institutions, and agriculture-related enterprises. The services provided by government agencies (concentrated in welfare and basic fields) cannot meet the personalized, diversified, or high-end socialized agricultural service needs of smallholders. The flexible and diverse service supply of agricultural cooperatives and other subjects can more easily meet the needs of smallholders. On the other hand, as agricultural enterprises improve their credibility by providing higher-quality socialized agricultural services, smallholders become more willing to purchase them [85].

### *3.4. Rules-in-Use*

#### 3.4.1. Institutional Factors

(1) Institutional Innovation

The agricultural service scale operation resulting from the development of socialized agricultural services, and the farmland scale operation resulting from land-tenure transfer, will lead to a contradiction between market competition and farmers' independent choice. Therefore, institutional innovation is needed to produce balanced competition, so that the supply of socialized agricultural services can be stabilized. Institutional innovation, therefore, can improve the environment where socialized agricultural services are carried out and can increase the utilization by smallholders of socialized agricultural services [91].

(2) Technological Changes

Technological changes can change the endowment structure among resource, capital, and other factors of agricultural production and management subjects and affect the division and cooperation of agricultural activities directly and indirectly. The evolution of technological changes, therefore, shapes the evolution process of the mode of agricultural production cooperation as follows: the internal cooperation of small peasant households, supplemented by cooperative labor exchanges → farmers' passive involvement in coopera-

tive production → the deepening marketization and socialization of agricultural activities cooperation → the complete marketization and socialization of agricultural activities cooperation [92].

(3) Institutional Integrity

The institutional integrity and standardization of socialized agricultural service organizations can significantly affect the use of such services by smallholders. Due to the long cycle of agricultural production and inconsistent input and output times, potential moral risks exist in different aspects of socialized agricultural services [26]. In particular, agricultural socialized organizations with a low degree of standardization are more likely to face moral risks.

In the enterprise-led socialized agricultural service organization, a perfect organizational institution helps to increase the use of socialized agricultural services by smallholders because, in addition to new models of socialized agricultural services, the efficient organizational mode and perfect organizational institution can significantly improve the performance of socialized service enterprises and increase the income of smallholders [93]. An ideal organizational institution would improve the company's management efficiency, increase the income from agricultural specializations, and integrate relevant resources to improve service efficiency.

#### 3.4.2. Organizational Factors

The interest connection mechanisms of socialized agricultural services led by cooperatives, enterprises, and village collective economic organizations differ due to the organizational modes of the main suppliers of such services. Therefore, organizational modes determine the decision of smallholders to use socialized agricultural services: the above classification of organizations into three types is partly applicable to the market-oriented interest connection mechanism. Smallholders usually dock with market subjects through village collectives, local agricultural machinery workers, and rural brokers, but single-income-source smallholders only obtain income from the sales of agricultural products corresponding to, or slightly higher than, the entrusted land area [94]. The joint-stock cooperative connection mechanism, an income-increasing mechanism dominated by land share dividends for smallholders, can better mobilize the enthusiasm of smallholders. This interest connection mechanism frequently applies to part-time smallholders, who rely less on the land and voluntarily take shares in cooperative management [95].

The collective organizational path can connect smallholders with socialized agricultural services. First, it can integrate all kinds of means of production. On the one hand, it can lead villagers to carry out large-scale planting, drive self-organized smallholders to integrate land production factors, and solve the negative impact of fragmented cultivated land on smallholders' use of socialized agricultural services. On the other hand, this mode can integrate other means of production, such as the purchase of advanced agricultural machinery and the organization of agricultural machinery service teams in a holistic way. It can also improve the capacity of socialized agricultural services at the village level and activate the village collective's service energy of motion [96]. Second, it can improve the village collective economy. The socialized agricultural services dominated by the village enhance the economic development in the village, further consolidate the supply capacity of such services at the village level and help to establish a long-term mechanism for the connection between smallholders and modern agriculture [97].

Specifically, a rural community organization is a political and social governance unit rooted in the village. Its holistic planning function is based on the institution of collective land ownership, the combination of governance and services, and the integration of semiformal rules and ethical constraints [98]. Moreover, embedded organizations, equipped with multiple institutions, can reduce the transaction costs of the cooperation between socialized agricultural service providers, cooperatives, farmers, village collectives, and government departments [99].

#### 3.4.3. Farmland Registration and Certification

Opinions are divided among scholars as to whether farmland registration and certification affects smallholders' decisions to use socialized agricultural services.

Some scholars believe that farmland registration and certification helps to promote smallholders' decisions to utilize socialized agricultural services. This is because there are clearer property rights of agricultural land due to farmland registration and certification, and the loose relationship between land contracting rights and management rights increases the tradability of agricultural land tenure. This encourages farmers to choose socialized services to improve the allocation of labor resources and land resources. In addition, the subdivision of property rights also deepens the agricultural division of labor, which promotes the development of socialized agricultural services [100].

Other scholars hold the opposite view: that farmland registration and certification increases the variability of the demand of smallholders for socialized agricultural services in different ways. For instance, it reduces their demand for mechanized agricultural services. This is because farmland registration and certification better guarantees the exclusive use rights and income rights of the transferred plots, reduces the uncertainty of agricultural land transfer, and stabilizes the transferee's expectations of the plots' management rights. Accordingly, this encourages smallholders to invest in agricultural machinery and eventually reduces their demand for outsourcing services in corresponding areas [58].

Some scholars also believe that farmland registration and certification does not significantly affect smallholders' decisions to utilize socialized agricultural services. This is because the rise in farmers' labor costs and the decrease in agricultural machinery use costs will cause agricultural machinery to replace labor, whether the land rights are approved or not [82]. In addition, the stability of farmland tenure will also have an impact. With the adjustment of farmland tenure for the purpose of achieving a fair distribution, smallholders cannot effectively allocate agricultural production resources, which will affect their demand for agricultural production services [101].

#### 3.4.4. Incentive Mechanism

An effective incentive mechanism is needed to promote smallholders' utilization of socialized agricultural services. For example, in his research on the model of agricultural cooperation systems in Chongzhou, Sichuan, China, Guo noted that the incentive dividend mechanism based on a minimum rent and a secondary dividend can promote an enabling environment where smallholders, professional agricultural managers, industrialized agricultural enterprises, and socialized agricultural service subjects can work together to encourage smallholders to use agricultural socialized services [102].

In addition to the organizational mode, the subsidy system of agricultural machinery purchases is another key factor affecting smallholders' collective action. The agricultural machinery purchase subsidy has different impacts on different types of socialized agricultural services. Some studies, for example, show that it can significantly encourage smallholders to purchase land preparation machinery due to the much higher price of agricultural harvesting machinery; thus, reducing the demand for socialized services in land preparation. In harvesting, however, the demand for socialized services has not changed significantly [58].

Some scholars further noted that agricultural machinery subsidies cannot significantly encourage smallholders to purchase agricultural services. On the contrary, an inappropriate subsidy will lead farmers into making incorrect decisions. When the market of socialized agricultural services is not perfect, the use of subsidies can advance their application and development [55].

## 4. The Effects of Smallholders' Utilization of Socialized Agricultural Services

The third section of this paper mainly analyzes the key factors of smallholders' cooperative utilization of socialized agricultural services from the perspective of influencing factors. In order to clarify the logical relationship from cause to result, the fourth section

mainly analyzes the possible impacting effect of the cooperative utilization of socialized agriculture services. On this basis, the fifth part uses the IAD framework to sort out and summarize the logical relationship between cause and result. On the whole, the effect of smallholders' cooperative utilization of socialized agricultural services can be divided into direct and indirect outcomes: the direct outcome is farmland scale management, and indirect outcomes mainly include improving agricultural productivity, increasing grain yields, and increasing farmers' income.

### *4.1. The Direct Outcome: Farmland Scale Management*

Socialized agricultural services significantly promote the large-scale management of cultivated land, especially in pre- and post-production [103,104]. During agricultural production, the fragmented cultivated land of smallholders remarkably reduces agricultural productivity [105]. Fragmented cultivated land can be improved by socialized agricultural services in the form of land resource concentration through "scale services" [106].

### *4.2. Indirect Outcomes*

#### 4.2.1. Agricultural Productivity Improvement

Previous studies have shown that socialized agricultural services improve the total agricultural productivity because they can promote technological progress in two ways. Directly, they can support financial services, integrate agricultural technology information, develop new ways to popularize agricultural technologies, and disperse the risk of technological progress [29,107,108]. Indirectly, they can improve the allocation of agricultural science and technology resources, affect technological progress through technological spillover, and improve the quality of practitioners and thus promote technological progress [109,110]. For example, Picazo-Tadeo studied whether there is a mutually beneficial relationship between agricultural production services and technical efficiency in Spanish farms and found that the improvements in agricultural services can promote technical efficiency [111].

Different types of socialized agricultural services have different impacts on agricultural productivity. For example, according to the survey data on rice growers in the Jiangsu and Jiangxi provinces of China, labor- and technology-intensive services help to improve rice productivity, but their effects differ. Socialized services in land preparation, relocation, harvesting, and other labor-intensive production have no significant impact on rice productivity, while those in seedling raising, pest control, and other technology-intensive production have a significantly positive impact on rice productivity [112]. Liu believes that, in the Chinese Comprehensive Experimental Station of the rice industry, rice productive services, such as financial and insurance services, technical services, mechanical services, and processing and sales services, can significantly improve cost efficiency and save production costs, but agricultural material supplies do not play a significant role in cost savings [113].

#### 4.2.2. Grain Yield Increases

Socialized agricultural services can significantly increase grain yields. For example, Yan's analysis of Chinese provincial panel data from 2008 to 2017 showed that the unit yields of grain will increase by 0.7% for every 1% increase in the development level of socialized agricultural services. The development of different subsectors of socialized agricultural services has different effects on the increase in grain yields, among which agricultural logistics has the greatest impact. The per unit yield of grain will rise by 1.1% for every 1% increase in the development level of the agricultural logistics industry [114].

Socialized agricultural services can increase grain yields for three reasons: First, they can lead to a specialized division of labor. Socialized agricultural services represent the re-division of the labor required for agricultural activities. The division of labor will inevitably improve specialization and recombination with agricultural production, which will improve agricultural productivity and increase grain yields [114]. Second, socialized

agricultural services can generate new technologies. They can complement traditional science and technology in the process of grain production, resulting in an increase in grain yield per unit area. Third, socialized agricultural services can attract capital. They are better able to aggregate and regenerate capital and to transfer capital from finance, insurance, and other sectors to the agricultural production sector, so as to improve the capitalization of the grain production sector [113].

However, some scholars have noted that socialized agricultural services have different impacts on the yields of different varieties of crops. According to the research by Wang on 710 Chinese farmers, socialized agricultural services can significantly promote rice production but not wheat production [115].

#### 4.2.3. Income Increases for Farmers

Socialized agricultural services can significantly increase farmers' income [30]. As the size of per capita cultivated land expands, the relationship between the two shows a law of increasing marginal effect. In particular, in the main grain-producing area, when the per capita operating land size reaches a certain threshold, it is more conducive to increased income for the use of agricultural productive services. According to an analysis by Zhao of survey data from 800 administrative villages in China, farmers who do not adopt socialized agricultural services will see their per capita annual income significantly decrease by 28.7–30.24%, i.e., RMB 1770–1868. If an administrative village providing irrigation services, tractor farming services, or pest control services no longer provides those services, the income of farmers in the village will fall by 22.5%, 4.01%, and 14%, respectively [116].

Socialized agricultural services help increase farmers' income in three ways: First, socialized agricultural services directly affect farmers' income, which mainly results from the comparative advantage and the large-scale economy effect brought about by the professional division of labor. Second, such services improve the resource allocation of peasant households. When new technologies are put into agricultural production, they will improve output, quality, cost saving, and agricultural income [117]. Third, technological progress has reduced the demand for labor and decreased labor intensity at busy agricultural times, so the surplus labor force is "squeezed out" to cities for additional wage earning.

## 5. A Mechanism Analysis of Facilitating Smallholders to Utilize Socialized Agricultural Services

Figure 3 shows a mechanism map for the cooperative utilization of socialized agricultural services by smallholders according to the IAD framework. In this map, the center is the action arena, which contains the action situation and the participants (smallholders in this study). The action arena demonstrates how smallholders act according to their internal interactions and their expectations of the results in the case of external variables. Due to the lack of information communication and interaction between smallholders in the process of utilizing socialized agricultural services, smallholders make choices directly under the influence of market supply. Therefore, we can simplify this into the internal incentive and smallholders' decision-making behavior. The internal incentive refers to the enthusiasm of smallholders to carry out the cooperative utilization of socialized agricultural services in a specific policy environment. Decision-making behavior refers to objective conditions (e.g., farmland characteristics) and subjective factors (e.g., risk preference). The internal incentives and smallholders' decision-making behavior will jointly determine the implementation effects of smallholders' cooperative utilization of socialized agricultural services.

A series of influence variables affect the action arena. The literature reveals that smallholders' utilization of socialized agricultural services is affected by four sets of external variables: household characteristics, biophysical conditions, attributes of community, and rules-in-use. Each group contains many factors: Household characteristics include the labor force, household financial status, risk preference, and part-time farming. Biophysical conditions include the size of the farm, farmland fragmentation, land-tenure transfer, land

quality, the distance from the village to the township, and the topography. Attributes of community consist of regional differences, economic development, employment cost, and credibility. Rules-in-use include institutional factors, organizational factors, farmland registration and certification, and incentive mechanisms. These different variables work together to form the action situation of participants (smallholders) in the action arena. In different situations, smallholders can choose land trusteeship, joint tillage and planting, land entrusted to individuals, as well as other interaction modes of cooperation, which will ultimately affect agricultural productivity, grain yields, farmers' income, labor force substitutes, and other outcomes.

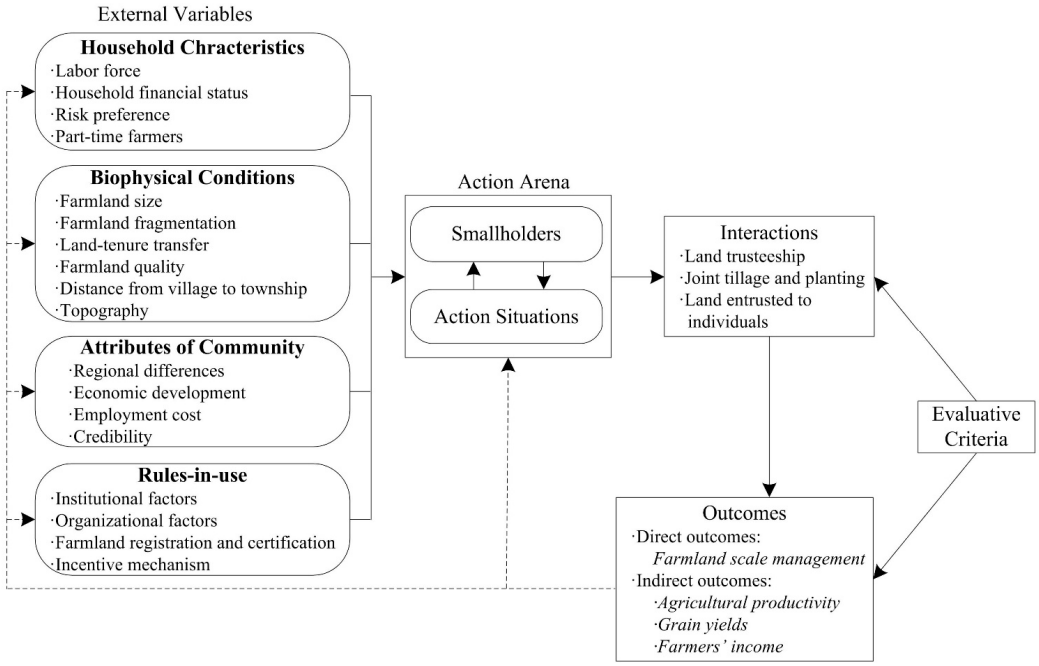


**Figure 3.** Influencing factors and effects of cooperative utilization of agricultural socialized services by smallholders.

Weak smallholders are apt to become victims of interests in the market competition and to be marginalized in the agricultural industry chains. Therefore, during their utilization of socialized agricultural services, the influencing factors show complex characteristics. The literature reveals that smallholders' utilization of socialized agricultural services is affected by many factors that interact to constitute the action situation in which they make decisions. Specifically, household characteristics, such as household labor shortage, family income, and price sensitivity, encourage smallholders to utilize socialized agricultural services, while their risk preference has a negative effect. Working part-time does not have a clear effect on their decisions. Among biophysical conditions, key factors such as the size of land-tenure transfer, the land-tenure transfer period, and the distance from the village to the township affect their decision to utilize socialized agricultural services. Farmland fragmentation, farmland quality, and a mountainous or hilly terrain have adverse effects, the farmland size may have a positive or inverted U-shaped impact, and the impact of the price of land-tenure transfer remains to be determined. In terms of attributes of community, the credibility of socialized agricultural service providers encourages smallholders to utilize their services. The impact of regional differences, economic development, and local labor costs remains to be determined. In terms of rules-in-use, institutional innovation, technological changes, and institutional integrity can drive smallholders to cooperate in collective action. The impact of the organizational mode depends on various factors, and farmland registration and certification as well as incentive mechanisms have no clear impact on smallholders' choices.

Rules-in-use are important attributes affecting action situations through the structural configuration of the action arena [118]. Rules-in-use differ from the other three attributes: rules are more flexible and diversified than the other three attributes—that is, each factor has a clear goal and direction. Each factor affects the factors of the other three attributes, and the flexibility of rules-in-use enables them to greatly adjust the impact of other factors on the action situation [119]. Specifically, institutional innovation can solve the family labor shortage, technological changes can reduce the risk preference of smallholders, institutional integrity can enhance the credibility of providers, the organization mode of providers can reduce the negative effect farmland fragmentation, farmland registration and certification can reduce the risk preference of smallholders, and the incentive mechanism can decrease the sensitivity of smallholders to service price. Rules-in-use, therefore, can significantly regulate the impact of other factors on the collective action, obviously advance socialized agricultural services, and further increase farmers' willingness to use the agricultural services.

In addition to the factors in relation to rules-in-use, other factors are more or less interrelated. For example, the actual conditions related to the farmland in physical conditions determine the regional economic differences, employment costs, and other aspects. The different variables in the attributes of community jointly form the environmental background of smallholders' agricultural production and rural life and thus affect many aspects, such as the flow-in and -out of the family labor force, the family income, and the smallholders' participation in part-time jobs. Therefore, the interaction of all factors jointly determines the environment where smallholders cooperate to utilize socialized agricultural services, and thus affects the decision-making behavior of smallholders.

Under the influence of external variables, smallholders in an action arena make decisions on whether they will use socialized agricultural services. The choices of all smallholders will form a certain interaction mode, such as land trusteeship, joint tillage and planting, or land entrusted to individuals, which will lead to corresponding outcomes, such as farmland scale management, improved agricultural productivity, increased grain yields, and increased income for farmers. Following the above interaction mode and outcome, the evaluative criteria, such as the proportion of smallholders utilizing socialized agricultural services in the region, can also be introduced in this map (see Figure 4).

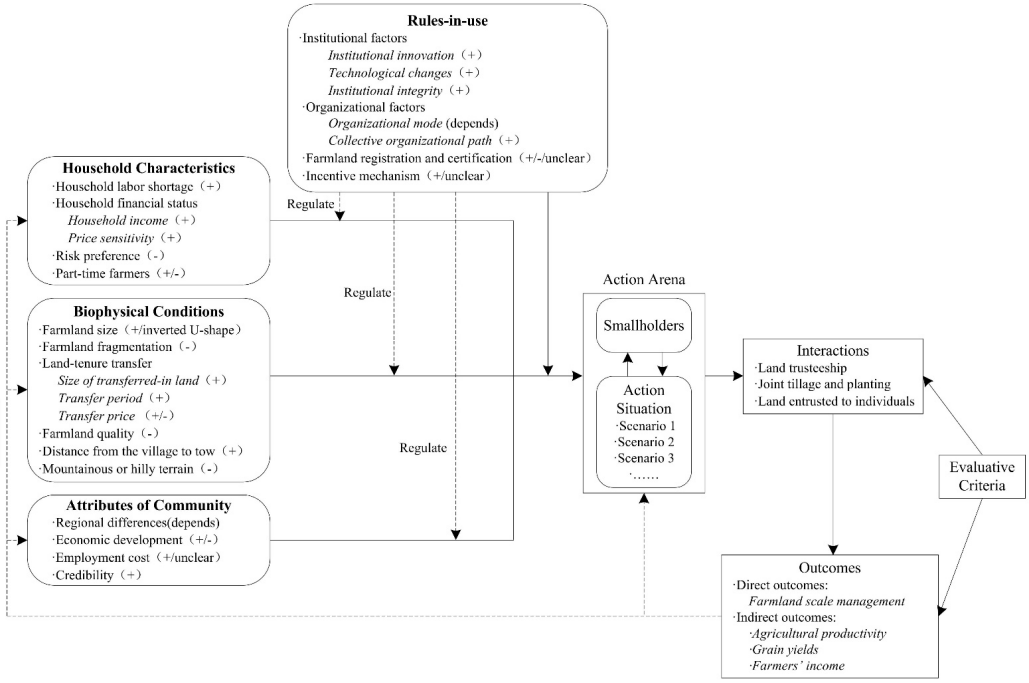


**Figure 4.** Mechanism of the cooperative utilization of agricultural socialized services by smallholders.

## 6. Conclusions

This paper focused on the factors affecting smallholders' decisions to utilize socialized agricultural services, and the effects of their use of such services. Under the guidance of the IAD framework, the paper explored the mechanism of smallholders' utilization of socialized agricultural services based on the relevant literature. Four categories of factors affect smallholders' decisions: household characteristics, biophysical conditions, attributes of community, and rules-in-use. These factors interact to determine smallholders' utilization of socialized agricultural services. Each factor has different effects on smallholders' decisions because the influential factors interact to form the action situations of smallholders in different environments—that is, the specific impact of each factor on smallholders' decisions to utilize socialized agricultural services depends on specific conditions. Among these factors, rules-in-use, flexibility, and diversity can affect each component of the household characteristics, biophysical conditions, and attributes of community in many ways. Therefore, rules-in-use play a key role in the mechanism. Smallholders' decisions to utilize socialized agricultural services can alleviate many problems in agriculture and rural development, e.g., it can improve the efficiency of agricultural production, increase grain yields and the income of farmers, and solve the issue of an aging rural labor force.

This research has some limitations that further research can address in the future. First, more mechanisms can be explored within a consistent framework. This paper only reveals the influencing mechanism of smallholders' cooperative utilization of socialized agricultural services from the perspective of the attributes of four external variables. However, due to the complexity of the logical relationship among all factors, it only focuses on the impact of rules-in-use on other factors and does not fully discuss the logical relationship among different factors. In the future, researchers can supplement the effect of more external variables in the system in different environments and provide insights on the interaction relationship of the factors found. Moreover, additional research can include an analysis of diversified institutions regulating different types of external variables, as well as an exploration of the intermediary relationship between different external factors. Researchers can also use the upgraded IAD framework, known as the social–ecological system (SES) framework [120], to establish a more systematic framework for analyzing smallholders' decisions to utilize socialized agricultural services. Furthermore, more interdisciplinary research can be conducted. Smallholders' decisions to utilize socialized agricultural services are affected both naturally and socially. The IAD framework provides a systematic analysis language for studying cooperation among smallholders. In the future, interdisciplinary research can help build a more systematic picture that includes both natural factors (including geology, landforms, geographical location, climate, hydrology, soil, biology, and natural disasters) and social factors (such as policies, markets, traffic conditions, the labor force, etc.), to improve the systematic research results. Additionally, research on cooperation among smallholders should be perceived as an opportunity to explore the dynamic mechanism of the development of socialized agricultural services. The key to connecting scattered smallholders with socialized agricultural services is organizing the scattered small-scale producers. Future research can provide further insights into this dynamic mechanism. More research is needed to support the establishment of a socialized service system for smallholders to promote the development of socialized agricultural services.

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