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Socialized Agricultural Services and Rural Industrial Resilience in the Yellow River Basin: A County-Level Governance Framework from the Perspective of Human Geography

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ABSTRACT
The modernization of agriculture in China increasingly depends on institutional and spatial arrangements that connect smallholders with technology, machinery, finance, markets, and ecological governance. Socialized agricultural services have become a key mechanism for overcoming fragmented production and improving the capacity of rural industries to withstand market, demographic, and climate-related shocks. Taking the Yellow River Basin, especially county-level areas in Henan Province, as the analytical context, this paper develops a human-geographical framework for understanding how socialized services contribute to rural industrial resilience. The paper argues that these services should not be treated merely as operational outsourcing or mechanization support. They function as spatial intermediaries that reorganize production factors, reshape actor networks, reduce transaction costs, and improve the adaptive capacity of rural industrial systems. On the basis of policy analysis, literature review, and a proposed county-level research design, the paper constructs a conceptual chain of service accessibility, actor coordination, industrial resilience, and urban-rural integration. It further proposes differentiated governance pathways for grain-producing counties, peri-urban counties, ecologically constrained counties, and counties with integrated agriculture, culture, and tourism. The study contributes to the literature by linking socialized agricultural services with regional resilience and spatial governance. It also provides a practical framework for future empirical research and policy design in the Yellow River Basin.

KEYWORDS
Socialized agricultural services; Rural industrial resilience; Yellow River Basin; Human geography; County-level governance; Urban-rural integration

1 Introduction

Rural transformation in contemporary China is not simply a process of increasing agricultural output. It is a multidimensional restructuring of land use, labor allocation, technology adoption, public services, local governance, and spatial relations between urban and rural areas[1]. The question of how to maintain productive agriculture while dealing with smallholder fragmentation, rural aging, labor migration, ecological constraints, and market volatility has become central to discussions of agricultural modernization and rural revitalization. In this context, socialized agricultural services have received growing attention because they provide a practical way to connect dispersed farm households with modern production systems without necessarily replacing household-based land rights or local farming traditions.

Socialized agricultural services refer to a broad set of service activities provided by cooperatives, enterprises, village collectives, agricultural machinery teams, technology extension agencies, digital platforms, financial institutions, and other actors. These services may include land preparation, seedling raising, sowing, plant protection, irrigation, harvesting, storage, marketing, technical guidance, production trusteeship, risk management, and digital information support. Their importance lies in the fact that they can transform the organizational conditions of agriculture. Smallholders who cannot independently purchase machinery, hire technicians, obtain market information, or manage risk may gain access to these resources through service networks. As a result, the problem of "who will farm the land" can be addressed through service-based scale economies rather than only through land transfer or farm enlargement.

The Yellow River Basin offers a particularly meaningful context for examining this issue. The basin is a strategic region for ecological protection, food security, cultural heritage, and high-quality development. It contains important grain-producing areas, rapidly urbanizing corridors, traditional villages, ecological restoration zones, and counties facing population outflow[2]. Henan Province occupies a critical position in the middle and lower reaches of the basin. Its county-level areas are highly diverse: some are major grain-producing counties, some are peri-urban counties influenced by metropolitan expansion, some are located in ecological and cultural zones, and some are attempting to integrate agriculture with manufacturing, logistics, tourism, and vocational education. This diversity makes Henan an appropriate field for understanding how agricultural service systems operate under different spatial conditions.

This paper aims to develop a conceptual and governance framework for analyzing the relationship between socialized agricultural services and rural industrial resilience in the Yellow River Basin. It does not claim to provide final empirical results; rather, it presents a publishable analytical article that can support future fieldwork and quantitative verification.

The central argument is that socialized agricultural services are spatial intermediaries. They do not only provide technical operations; they reorganize relations among farmers, land, markets, technologies, institutions, and ecological constraints. Through this reorganization, they can strengthen the capacity of rural industries to resist shocks, recover from disruptions, adapt to change, and pursue long-term transformation.

2 Policy and Regional Background

China's rural policy environment has increasingly emphasized agricultural modernization, food security, integrated urban-rural development, and comprehensive rural revitalization. The 2026 No. 1 Central Document identified agricultural and rural modernization and all-around rural revitalization as key tasks for the opening years of the 15th Five-Year Plan period[3]. It called for strengthening agricultural foundations, safeguarding food security, improving rural industries and infrastructure, and promoting better living conditions for farmers. This policy orientation indicates that rural development is no longer evaluated only by output growth; it is also judged by the quality, resilience, and sustainability of rural systems.

The Yellow River Basin strategy adds another layer of significance. The national outline for ecological protection and high-quality development of the Yellow River Basin stresses ecological conservation, water security, high-quality development, cultural protection, and coordinated regional governance. The basin covers nine provincial-level regions and includes a large population and vast land area. Henan's counties within the basin are therefore located at the intersection of national food security, ecological constraints, historical-cultural heritage, and county-level modernization[4]. These overlapping tasks require governance tools that are both productive and spatially sensitive.

County-level governance is especially important because counties are the basic units where agricultural services, rural industries, public resources, and grassroots organizations meet. Policies may be formulated at the national or provincial level, but they are implemented through county departments, township governments, village collectives, cooperatives, service enterprises, and farmer households[5]. The effectiveness of socialized agricultural services therefore depends not only on policy support but also on local service density, transport conditions, village organization, digital infrastructure, industrial chains, trust relations, and the capacity of local governments to coordinate multiple actors.

In Henan, the development of socialized services is closely related to grain production, agricultural mechanization, rural labor migration, and the growth of new agricultural business entities. Many counties have developed agricultural machinery cooperatives, production trusteeship services, plant protection teams, storage and logistics networks, and digital information platforms. At the same time, service imbalance remains visible. Some villages are easily reached by service providers, while others face weak service supply[6]. Some farmers trust cooperatives and service organizations, while others remain cautious because of cost, quality, or contract concerns. Such differences suggest that socialized services should be analyzed as spatially uneven and institutionally embedded systems.

3 Literature Review

The first group of studies concerns smallholders and agricultural modernization. Smallholders remain widely present in China despite decades of agrarian reform and modernization. Their persistence means that agricultural modernization cannot rely exclusively on large farms. A service-based model can allow smallholders to participate in modern agriculture while keeping household-based land arrangements. This approach is significant because it reduces the conflict between fragmented landholding and the need for modern inputs. Instead of expecting every household to own advanced machinery or master complex technologies, socialized services can provide shared access to modern production capacity.

The second group of studies focuses on the effects of socialized agricultural services. Recent research indicates that service systems can influence green production behavior, technical efficiency, cost reduction, and income improvement. For example, studies on rice production and green fertilization behavior show that external services may stimulate farmers to adopt more sustainable practices when service providers offer technical guidance and standardized operations. Other studies argue that agricultural service systems can support rural industrial revitalization by connecting production, processing, logistics, and marketing. These findings are important, but they often measure service effects at the household or provincial level and do not fully explain how services become spatial networks inside counties.

The third group of studies concerns resilience. Resilience originally referred to the ability of a system to absorb disturbance and maintain function, but it has been widely applied to regional economies, rural communities, and agricultural systems. Rural industrial resilience can be understood as the capacity of rural industries to withstand shocks, recover from disturbances, adapt to structural changes, and transform toward higher-quality development. For counties in the Yellow River Basin, shocks may include drought, flood, market price fluctuation, labor shortage, aging, input cost increase, and ecological regulation. Socialized services can potentially enhance resilience by reducing production uncertainty, improving technical response, widening market channels, and strengthening organizational coordination.

4 Conceptual Framework: Services as Spatial Intermediaries

This paper conceptualizes socialized agricultural services as spatial intermediaries. A spatial intermediary is an institutional and organizational mechanism that connects dispersed actors and resources across space. In the agricultural context, service providers connect farmers with machinery, technology, finance, markets, data, and public policy. They also connect villages with county-level industrial chains and urban consumption networks. This intermediary role is especially important in regions where households are small, production plots are fragmented, and market access is uneven.

The proposed framework contains four dimensions. The first is service accessibility. Accessibility includes the number of service providers, service radius, price, timeliness, technical quality, reliability, and digital availability. A service that exists at the county seat but cannot reach distant villages during the critical farming season has limited practical value. Accessibility therefore needs to be measured not only by administrative coverage but also by spatial reach and operational capacity.

The second dimension is actor coordination. Rural industry involves farmers, cooperatives, family farms, village collectives, enterprises, vocational schools, agricultural extension agencies, financial institutions, e-commerce platforms, and local governments. Socialized services create opportunities for these actors to cooperate[7]. For example, a machinery cooperative may work with a village collective to provide unified harvesting, while an agribusiness may coordinate with farmers through standardized production and purchase contracts. The strength of actor coordination affects whether services remain isolated operations or become part of an integrated rural industrial network.

The third dimension is industrial resilience. Service systems may enhance resilience through at least four mechanisms. First, they reduce production risk by providing timely machinery and technical support. Second, they improve recovery capacity after shocks by mobilizing equipment, labor, and information quickly. Third, they promote adaptation by introducing new technologies, new varieties, digital tools, and green production standards. Fourth, they support transformation by connecting agriculture with processing, logistics, branding, tourism, and ecological value realization.

The fourth dimension is urban-rural integration. Socialized services can become channels through which urban capital, technology, markets, and talents enter rural areas. They can also help rural products reach urban consumers and industrial chains. However, this integration is not automatic. If service systems are controlled only by external capital without local participation, farmers may become passive recipients. If county governance can protect farmer interests and strengthen local organizations, service systems are more likely to generate inclusive development.

The conceptual chain can be expressed as follows: service accessibility provides the basic condition; actor coordination converts services into networks; industrial resilience reflects the system-level outcome; and urban-rural integration represents the broader developmental effect. This chain is moderated by county context, including agricultural structure, transport infrastructure, ecological constraints, digital capacity, village organization, and local governance quality.

5 County Types and Differentiated Mechanisms in Henan

County-level diversity is a key feature of the Yellow River Basin in Henan. Different counties require different service strategies. A uniform service model may fail because local conditions vary greatly. This paper proposes four analytical types.

The first type is the major grain-producing county. These counties are usually characterized by relatively large cultivated land areas, high dependence on wheat and maize production, strong demand for mechanized operations, and sensitivity to seasonal labor shortages. In such counties, socialized services mainly contribute to resilience by stabilizing production processes[8]. The priority should be to strengthen full-process trusteeship, machinery scheduling, plant protection services, storage, grain drying, and disaster response capacity. Service networks should be organized around farming seasons and production risks. Digital dispatching platforms and county-level emergency machinery teams can improve timeliness during extreme weather.

The second type is the peri-urban county. These counties are influenced by metropolitan expansion, industrial parks, logistics corridors, and urban consumption markets. Rural land use and labor allocation are often more diversified. In these areas, socialized services should not focus only on grain operations. They should also support facility agriculture, vegetable production, fresh food logistics, cold chain services, quality certification, e-commerce, and urban-rural tourism. The resilience mechanism lies in market connection and industrial diversification. However, peri-urban counties also face land conversion pressure and social differentiation, so governance must protect agricultural space and smallholder benefits.

The third type is the ecologically constrained county. Some counties along the Yellow River face water constraints, ecological restoration tasks, floodplain governance, soil conservation requirements, or cultural heritage protection. In these areas, services should be linked with green production, water-saving irrigation, ecological monitoring, low-carbon

agriculture, and compensation mechanisms. The resilience mechanism is not merely productivity enhancement but ecological adaptation. Service providers can help farmers adopt standardized green practices and reduce environmental risks. Local governments should encourage service packages that combine production support with ecological compliance.

The fourth type is the integrated industry county. These counties attempt to combine agriculture with processing, rural tourism, cultural heritage, education, logistics, or manufacturing. In such counties, socialized services should extend beyond production and become part of a broader industrial ecosystem. Services may include brand planning, product design, marketing, vocational training, cultural interpretation, and digital management. Rural industrial resilience depends on the ability to diversify income sources while maintaining local identity and ecological limits.

These four types are not mutually exclusive. A single county may contain both grain-producing townships and peri-urban villages, or both cultural tourism resources and ecological constraints. Therefore, the typology should be used flexibly. Its main value is to remind researchers and policymakers that socialized agricultural services are place-specific. They must be embedded in county industrial structure, rural settlement patterns, ecological conditions, and governance capacity.

6 Proposed Research Design for Empirical Verification

To transform the conceptual framework into an empirical study, a mixed-method design can be adopted. The first step is to build a county-level indicator system. Service accessibility can be measured through indicators such as the number of agricultural service organizations, machinery ownership, trusteeship area, service coverage, agricultural technician density, digital platform availability, and distance from villages to service centers. Rural industrial resilience can be measured through indicators such as agricultural output stability, income diversification, recovery after disasters, value-added processing capacity, market channel diversity, and growth of new agricultural entities. Urban-rural integration can be measured through transport accessibility, digital infrastructure, employment structure, public service provision, and income gap indicators.

The second step is spatial analysis. GIS tools can be used to map the distribution of service organizations, cultivated land, transportation networks, floodplain areas, townships, markets, and processing facilities. Spatial autocorrelation can identify whether high or low service capacity clusters in specific areas. Accessibility models can estimate the actual service radius of machinery teams or service centers. A geographic detector model or spatial econometric model can examine how infrastructure, industrial structure, population change, and governance factors influence service capacity and resilience.

The third step is case comparison. Quantitative analysis can reveal spatial patterns, but it cannot fully explain local mechanisms. Fieldwork should be conducted in selected counties representing different types. Interviews can be carried out with farmers, cooperative leaders, service enterprises, village cadres, township officials, agricultural technicians, vocational school teachers, and local companies. The purpose is to understand how services are organized, how contracts are formed, how trust is built, how risks are shared, and how farmers evaluate service quality.

7 Discussion

The framework proposed in this paper highlights the spatial nature of agricultural service systems. A service is never purely technical. It is delivered through roads, villages, contracts, platforms, trust relations, and administrative systems. The same machinery service may have different meanings in different places. In a grain-producing county, it may guarantee seasonal production. In a peri-urban county, it may free labor for non-farm employment. In an ecological county, it may help implement green standards. In an integrated industry county, it may become part of a branding and tourism strategy.

This perspective also helps refine the concept of rural industrial resilience. Resilience is not only the ability to maintain output after a shock. It includes the ability to learn, adapt, diversify, and transform. Socialized agricultural services can contribute to these capacities only when they are embedded in local actor networks. If services remain fragmented, low-quality, or inaccessible, their effect on resilience will be limited. If they become coordinated, trusted, and connected with broader industrial chains, they can support long-term rural transformation.

The Yellow River Basin requires special attention because development and ecological protection must be coordinated. Agricultural modernization cannot be pursued through unlimited resource use. Service systems should therefore be evaluated by both productivity and sustainability. This is where human geography can contribute: it can analyze how ecological constraints, cultural landscapes, rural livelihoods, and development strategies interact at different spatial scales.

The proposed study also has limitations. As a conceptual paper, it does not provide new statistical results. The framework needs to be tested through county-level data and fieldwork. The measurement of service accessibility and resilience may also face data limitations. Informal services, trust relations, and village-level coordination are difficult to quantify. Future research should combine statistical indicators with qualitative evidence to avoid reducing complex rural processes to simple numbers.

8 Conclusion

This paper has developed a human-geographical framework for understanding how socialized agricultural services may enhance rural industrial resilience in the Yellow River Basin. The central argument is that services function as spatial intermediaries. They connect smallholders with machinery, technology, markets, finance, ecological standards, and county-level governance. Through this intermediary role, they can improve service accessibility, strengthen actor coordination, enhance industrial resilience, and promote urban-rural integration.

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