

Agricultural socialized services can facilitate the rapid development of the Science and Technology Backyard

Tianzuo ZHANG (✉)

Ministry of Agriculture and Rural Affairs of the People's Republic of China, Beijing 100125, China.

Received August 21, 2023.

Correspondence: zhangtz@agri.gov.cn

© The Author(s) 2024. Published by Higher Education Press. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0>)

In agriculture, as in the industrial sector, internal labor division and specialization is a process of gradual differentiation and refinement. With the continuous development of agricultural production and services industries, agricultural production processes that were originally done independently by one household, such as ploughing, sowing, harvesting and other pre-production, mid-production or post-production processes, have been gradually separated and provided by professional socialized services organizations, gradually forming the agricultural service industry. Specialized, socialized and efficient production methods have contributed to the transformation of agricultural production from conventional resource wasting to resource efficient, and have become one of the paths to achieve agriculture green development (AGD). China is in a critical period of transition from conventional agriculture to AGD, and the combination of family-run production methods and socialized services is accepted by agricultural professionals and the Chinese government as a key contributor to the acceleration of sustainable development of Chinese agriculture.

1 Development of agricultural socialized services is an inevitable choice for achieving agriculture green development in China

Although the scale of agricultural production varies within and between, most agricultural activities globally are still done at

the household scale. For example, in Europe and America, large and medium-sized family farms have achieved agricultural sustainable production mainly through agricultural management of moderate scale family farms and modern farming equipment. Small and medium-sized family farms in Japan and South Korea have primarily achieved sustainable crop production as a result of high-cost government investment to equip each household with small but a comprehensive range of facilities and equipment. The achievement of the modernization of agriculture in these countries is not only associated with the size of the farm or land scale, but more importantly, the independent management of a household basis has significantly increased their motivation to actively engage in efficient production. The process of agricultural production in these countries exhibits strong characteristics of specialization, standardization and intensification. Data from the Chinese Government's third agricultural census show that the number of smallholders in China accounts for more than 98% of the main business entities and 70% of the cultivated land. However, only 0.07 ha of arable land per capita and no more than 0.67 ha per household are the status quo of agricultural production in China. Even more noteworthy is that the continued implementation of the government-imposed household contracted responsibility system for remuneration, means single households independently conduct agricultural production. Even though 70% of farmers in China have moved to the cities to make a living, more than 400 million smallholders, who earns their living mainly from agricultural production, remain in the countryside. In China, the

household basis, small-scale agricultural production makes it difficult to aggregate land for larger scale agricultural production in a short period of time, which makes it difficult to adopt the large-scale production methods as in Europe and the USA. Concurrently, due to the relative lack of development of China's agricultural economy, it is also difficult to achieve what has been achieved in Japan and South Korea production, which has been driven towards regenerative farming by their customers (McCains) and their governments, even though this requires high inputs and costs. This means that the ways of aggregating land through land transfer or promoting agricultural modernization through increased inputs are not feasible for China.

How to achieve AGD in China without land transfer and with smallholders continuing to hold land management rights is a key question. The emergence of socialized services, which is defined as a way of entrusting all or part of agricultural production to socialized services organizations or individuals to engage in production, provides a possibility for the sustainability of farming systems in China. Specifically, socialized services organizations concentrate the service needs of different types of smallholders, and by introducing advanced and applicable cultivars, technologies, equipment, organizational forms and other modern production factors into the agricultural process effectively, they not only improve resource use efficiency, but also integrate more smallholders into AGD. Specialized and standardized production services provided by socialized services organizations have become one of the most realistic and efficient ways for agricultural production in China. This means that in order to realize sustainable agricultural production, it is necessary to make every production link, even the whole process of production, sustainable. At the same time, it is also necessary to consider how to ensure the rights of smallholders to operate their land while uniting as many smallholders as possible who have land in close proximity to each other, so as to realize large-scale operation of services.

2 Agricultural socialized services constitute a major strategic industry

With the deepening of labor division and specialization in agricultural production, the agricultural services market has gradually moved to the inevitable trend to support AGD. In China, for example, the rapid development of a variety of socialized services organizations has resulted in the formation of a complete and highly developed agricultural services industry, where smallholders are free to purchase the services

they need, which promotes the sustainable development of the entire agricultural industry chain. From the market demand perspective, given the shortage of rural labor and an aging population, farmer demand for socialized services is intensifying and expanding in the market, and are becoming a powerful driving force for the development of the agricultural service industry. From the perspective of development conditions, after years of support, there are already large numbers of agricultural technology extension workers, and graduates of agricultural colleges and secondary specialized schools, as well as self-taught agricultural and farming experts who have grown up in rural areas of China. Data show that, so far, as consequence of previous policy pushes, China has a domestic agricultural machinery sector of more than 1 terawatt and a vast stockpile of supporting equipment or machinery, the numbers of which are in the range of tens of millions, in addition to a broad array of warehousing, logistics and processing facilities and equipment that have been established throughout the country. Also, China has fostered the development of more than 3 million new business entities of various types, including cooperative associations, family farms, large professional households and leading enterprises until now. The technology strength, facilities and equipment, service subjects and other aspects of the development of agricultural socialized services have all reached a scale which allows the development of a number of replicable and promotable models for AGD. In recent years, these have also been explored and established in practice. In terms of policy supports, governments at all levels are providing an increasing range of support for agricultural socialized services, shifting from supplementing service entities, equipment and technology to service links, and enhancing the overall level of agricultural modernization with the help of the development of service industry.

Irrespective of the perspective of market demand, development conditions or policy support, China has equipped its socialized services market with basic conditions for construction and development to allow boosting of AGD across the country. Socialized services organizations can seize the opportunity to accelerate agricultural development through two approaches. Firstly, at the level of development, since feeding more people with less land is a food security problem faced by the whole world, socialized services organizations should be oriented by market demand, focusing upon the production of grain and other bulk agricultural products. Attention must be given to the key bottleneck and the weak links in agricultural production processes, helping more traditional smallholders and large-scale farmers such as cooperatives to carry out high-efficiency agricultural production to promote sustainable

agricultural development. Secondly, at the policy level, it is necessary to improve support policies, strengthen the management of the socialized services industry, innovate service models, strengthen resource integration efficiency and vigorously develop different types of socialized services, so as to provide basic support for the realization of AGD.

3 Interaction between socialized services organizations and Science and Technology Backyards can promote the further development of both systems

The Science and Technology Backyard (STB) is an important platform for agricultural technology innovation, talent cultivation and technology diffusion. The Science Directors of STBs have been working closely with smallholders over a number of years to facilitate co-innovation and co-learning in the countryside and develop varieties of new adapted technologies and equipment to address labor shortage, water pollution, overuse of fertilizer and other production problems^[12]. However, over the years, the amount and range of technology development and application has been limited. Smallholders have little experience in technology promotion and the knowledge acquisition, farm size and motivation of smallholders to adopt new technologies can be limited.

The extension and application capacity of socialized services, combined with the technological innovation capacity of STBs, can result in a more rapid extension and application of new technologies. Socialized services organizations employ professional staff to undertake specialized work, these staffs through professional knowledge and skills, introducing the most needed, advanced and applicable cultivars or technical equipment for agricultural production, which means cost

saving, efficiency and profit maximization for both smallholders and socialized services organizations. Therefore, socialized services organizations tend to actively trial new technologies, and once successful, they will undertake large-scale promotion and application on the arable land of their service recipients, circumventing the difficulty of technological promotion in small scientific and technological institutes.

The combination of the knowledge-generating function of STBs with the service function of socialized services organizations can up-scale the social impact of the application of new technologies. In order to compensate for the shortage of agricultural labor, aging of the population and other problems, the services provided to smallholders by socialized services organizations have been transformed from single- to multi-segment, or even a full-sector focus. That is to say, socialized services organizations not only need know what the most suitable cultivar is, but also need to find the most suitable pesticides, fertilizers and agricultural machinery, and how to use the agricultural capital in the most effective way. STBs rely on professional research teams in universities to undertake their work, with a strong knowledge generation function, and socialized services organizations as an important vehicle for promoting technologies implementation such as “good seeds, good technology, and good system,” and other integrated and optimized technologies.

STBs can provide socialized services organizations with the technology solutions they need most, and socialized services organizations can help STBs realize the rapid promotion of technology. Therefore, the combination of the technological innovation and knowledge capacity of STBs with the promotion, application and service capacity of socialized services organizations will give both sides enhanced motivation to, achieve synergistic improvement in technological innovation and application efficiency, agricultural production efficiency, environmental benefits and other aspects, and promote the realization of AGD.

Acknowledgements

This commentary is a translation of the author's Chinese script. Thanks to Prof. Jianbo Shen and Dr. Yajuan Li (China Agricultural University, China) for the translation, and thanks to Prof. William J. Davies (Lancaster University, UK) for the revision.