The Issues in Agricultural Development in Jinshan District, Shanghai, from the Perspectives of Labor and Mechanization

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Abstract. Located in the far southwestern outskirts of Shanghai, Jinshan District ranks relatively low in terms of economic scale among the various districts in Shanghai. Guided by policies such as "Rural Revitalization" and "Beautiful Countryside," the agriculture in Jinshan District has been steadily developing. However, there are still certain challenges and issues during its development. Both agricultural operators and practitioners exhibit an aging trend, and the skills and literacy of agricultural laborers need improvement. Additionally, through the analysis of agricultural operator data and agricultural production data in Jinshan District, Shanghai, and the comparison between the average level of Shanghai's, it can be concluded that the current level of mechanization in Jinshan District is below the average level of agricultural mechanization in Shanghai. What account for these phenomena are the reluctance of younger labor force entering agriculture, bad agricultural labor force quality, low urbanization level and the small-scale operation. Eventually, We put forward some policy recommendations to decision-makers for the development of agriculture in Jinshan District such as expediting the urbanization level within the district, reallocating farming land, cultivating labor skills and transforming employment perspectives on agriculture.

Keywords: Agricultural development, labor, mechanization

1 Introduction

The Jinshan District is in the southern part of Shanghai and is one of the few areas in Shanghai that focuses on agricultural development. The data we collected from Shanghai Statistical Yearbook 2022 and Jinshan Statistical Yearbook 2022[1] shows that the rural population in Jinshan was approximately 254,700, with an agricultural population of around 141,446. There was a total of 2,306 villagers' groups in the district, and the total power of agricultural machinery (TPAM) were 74,086.91 kilowatts. In 2022, the Jinshan District achieved a regional gross domestic product (GDP) of 111.774 billion yuan, with the value added in the primary industry reaching 916 million yuan, representing a year-on-year price increase of 7.1%. The total annual output value of agriculture was 28.58 billion yuan, with a year-on-year growth of 9.3%. In the third agricultural census in Jinshan District (2016), there were 74,500 agricultural households, including 1,361 large-scale agricultural households. There were 747 agricultural

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operating units, and the total number of agricultural production and management personnel was 85,100.

In recent years, Jinshan District has been following the 14th Five-Year Plan for Rural Revitalization, focusing on promoting the upgrading of rural agriculture, facilitating the establishment of family farms, fostering cooperation among village collective economies, and forming a distinctive agricultural development model with Jinshan characteristics. Simultaneously, Jinshan District, during rural revitalization, plans to develop refined agriculture, construct a "green countryside" with unique technological content, improve the reservoir village in Caojing Town, establish wetland parks, and promote the development of Jinshan farmer paintings in Fengjing Town, advancing cultural communication efforts.

However, there are still some challenges during the development of agriculture in Jinshan. The quality of agricultural labor force wasn't ideal enough since the labor force has an aging trend and few young labors devote themselves to agriculture[2], causing the difficulties in agricultural development and mechanization. In addition, the mechanization level in Jinshan was far below the level in Shanghai due to the small-scale agricultural operation and the separation of sown lands[3]. The lower level of urbanization in Jinshan compared with the average level of Shanghai hinders agricultural mechanization as well.

2 The agricultural development challenges in Jinshan District

2.1 The quality of agricultural labor force

The agricultural labor force in Jinshan District faces challenges due to lower skill levels, a need for improved labor quality, and the aging of the agricultural workforce. We collected agricultural related data from the report on the third agricultural census in Jinshan District from Jinshan District Government official website, which is shown in Table 1. Basic Information on Labor in Jinshan District . There were 85,100 agricultural production and management personnel, roughly evenly distributed between males and females. Looking at the age composition, those below 35 years old accounted for 2.0%, those between 36 and 54 years old constituted 29.9%, and those aged 55 and above made up 68.1%. It is evident that the agricultural population has a higher degree of aging, with a lower proportion of young and middle-aged labor, which is unfavorable for the widespread adoption of agricultural technology and may lead to a generational gap among agricultural producers[4].

Examining the educational background, among agricultural production and management personnel, 11.2% had not completed primary school, 42.0% had completed primary school, 37.9% had completed junior high school, 7.2% had completed high school or vocational school, and 1.7% had completed college or above. The general low level of education among agricultural workers indicates a potential for improvement in labor quality. Due to the low education level of the agricultural labor, it is hard for them to operate machines, employ high-end technology and ultimately prosper the agriculture. In addition, those with education up to junior high school or below form the majority, deviating significantly from the development goals of modernized agricultural management, causing the loss of agriculture labor force.

Furthermore, the lower educational levels contribute to resistance in the adoption and improvement of agricultural technology. Simultaneously, this educational disparity reinforces the

existing perception that agriculture is not a "high-end" profession[5]. As a result, young and middle-aged agricultural operators and potential farmers are more inclined to leave agricultural work for employment in other industries[6], exacerbating the problem of aging in the agricultural workforce[7].

Table 1. Basic Information on Labor in Jinshan District

Item	Rate（%）
Gender composition	
male	49.4
female	50.6
Age composition	
those aged 35 and below	2.0
those aged between 36 and 54	29.9
those aged 55 and above	68.1
Educational composition	
those haven't been educated	11.2
those have been in primary school	42
those have been in junior school	37.9
those have been in senior high school	7.2
those have been in college or above	1.7

2.2 The mechanization process faces challenges under small-scale farming operations.

The difficulty in the development of the primary industry in Jinshan District can be partly attributed to the low level of mechanization and the challenges in advancing the mechanization process within the primary industry.

Table 2. Mechanization Information of Jinshan and Shanghai below shows the comparison of farming mechanization in Jinshan and Shanghai. TPAM refers to total power of agricultural machinery. TPAM* refers to total power of agricultural machinery minus the power used in fisheries and agricultural related auxiliary activities. TSA refers to the total sown area in agriculture. Since the fisheries and agricultural related auxiliary activities accounts for little amounts of total power, we just minus them and compare the power that per unit sown area has. PP refers to power that per unit of sown area owns. We used the agricultural data in 2021 to make comparisons. It is clearly shown that the power that per unit of sown area owns in Shanghai outweighs that in Jinshan, which indicate that agricultural mechanization in Jinshan is lower than that in Shanghai.

Table 2. Mechanization Information of Jinshan and Shanghai

2021	TPAM (kw)	TPAM* (kw)	TSA (10,000 mu)	PP(w/mu)
Shanghai	1252200	1049400	400.2	262.2
Jinshan	75341.03	68903.83	31.16443	221.1

The difficulty in mechanization, in turn, is associated with the low level of urbanization in the Jinshan area and the low degree of agricultural intensification. Urbanization allows rural populations to transition into urban populations, reducing the rural population and increasing the per capita agricultural land. As of 2022, the urbanization rate of permanent residents in Shanghai is 89.3%, while Jinshan District has an urbanization rate of 61.6%, significantly lower than the overall level of Shanghai.

The backward development of urbanization impedes agricultural mechanization. The migration of rural populations to urban areas not only transforms rural land into construction and industrial land but, more importantly, ensures a sufficient per capita agricultural land quantity, facilitating large-scale mechanized agricultural operations. When there is a substantial rural population, it is challenging to minimize the marginal benefits of individual household machinery use, making it difficult to achieve maximum overall efficiency. Currently, small-scale farming remains prevalent in Jinshan District, and my grandparents used to independently manage rural farmland in this way.

Under the prevailing small-scale farming model, with limited and dispersed agricultural land holdings of around a dozen acres each, the use of mechanized equipment does not lower agricultural costs. Instead, the lower quantity of land increases the average cost of using mechanized equipment, which finally increases farmers' total cost, reinforcing their reluctance to agricultural mechanization. Therefore, it is challenging to implement mechanized agricultural development under the small-scale farming model, posing a dilemma for modern agricultural development.

According to the data from the third agricultural census in Jinshan District up to 2016 (Table 3. Agriculture Operator in Jinshan), among the 74,476 agricultural operating households, only 1,361 were engaged in large-scale agricultural operations, accounting for approximately 1.8% of the total number. If the urbanization rate in Jinshan District increases and the number of agricultural populations in rural areas decreases without a drastic reduction in agricultural land, the per capita agricultural land would increase. This increase in per capita agricultural land holdings would facilitate mechanized agricultural production, contributing to the improvement of mechanization levels in agriculture.

Table 3. Agriculture Operator in Jinshan

Item	Number (household)
Agricultural Operators	74,476
Large-scale Agricultural Operators	1361

3 Insights and solutions

3.1 Expedite the urbanization level within the district.

To elevate the level of urbanization and enable the intensive management of agricultural land, it is crucial to transform rural areas into urban populations. With a fixed amount of agricultural land, the reduction in the agricultural workforce, coupled with an increase in per capita agricultural land, allows agricultural operators to engage in large-scale and intensive cultivation.

The urbanization process in Jinshan District is relatively moderate within the broader context of Shanghai. There exists significant potential for further urbanization. Among agricultural operating households, the number of large-scale farming operations is limited. Developing large-scale operations is not only a trend but also a future objective. Furthermore, the current low per capita agricultural machinery capacity in Jinshan District is fundamentally attributed to the decentralized small-scale farming model, which is incompatible with mechanized large-scale operations. The benefits of manual labor-intensive production in small-scale settings are

more pronounced. Therefore, the solution lies in the advancement of urbanization and the reduction of the agricultural population. This shift will increase per capita agricultural land, providing favorable conditions for the development of agricultural mechanization.

Furthermore, the urbanization actively promotes the development of infrastructure in cities and villages and make the infrastructure more accessible to agriculture operators. Studies (Soumya Manjuath and Elumalai Kannan 2017)[8] have proved that infrastructure availability can positively and significantly affect agricultural productivity. And the scale production makes the agriculture production more environmentally friendly (Ke H. Hao W. and Yangmei Z. 2023)[9].

3.2 Reallocation of farming land

Agricultural operators now meeting the problem of the separation their farming land. A certain part of one's sown area can deviate from or be located quite a far distance from the other parts. Thus, giving rise to the hinder of agricultural mechanization. One possible solution is to reallocate the sown land between agricultural operators. Making the sown land become more concentrated fuels agricultural operators' willingness to employ machine to operation, since the large scale of sown land reduces the average cost and marginal cost of using machine or technology.

3.3 Strengthening the cultivation of agricultural labor skills and transforming employment perspectives are crucial.

Promoting the development of agricultural labor skills, innovating employment perspectives, and encouraging the rejuvenation of the agricultural workforce are essential. From the earlier research about agricultural workers in Jinshan District, it is evident that there is a need to improve the labor skills of agricultural workers, and there are challenges related to an aging workforce. The resolution of these issues, much like urbanization, is closely tied to the transformation in employment perspectives of agricultural labor forces. Urbanization is not just a process of land urbanization; more importantly, it involves the urbanization of the population, which entails the transformation and improvement of existing rural lifestyles and perspectives.

The relatively low skills of agricultural workers contribute to a structural imbalance, hindering the concurrent development of the primary sector with the other three major sectors. The resistance and reluctance of the younger generation to engage in agriculture and the constraints of traditional employment views lead them to move away from agriculture and enter other industries, further exacerbating the aging problem among agricultural workers.

In the context of the "14th Five-Year Plan" for rural revitalization in Jinshan District, efforts are being made to vigorously promote the training of new-type farmers. Currently, 14 farmer field schools have been established, and 3,768 new-type professional farmers are being cultivated. To attract more young people to join the agricultural workforce, the district can enhance the service system for newcomers to start businesses in rural areas, encouraging various groups to engage in rural innovation and entrepreneurship. Special attention can be given to initiatives targeting overseas returnees and private entrepreneurs to contribute to the revitalization of rural areas.

4 Conclusion

This article, through analyzing relevant data within Jinshan District's agriculture, identifies issues such as low labor skills, an aging workforce and low mechanization levels. It proposes solutions to address these problems, advocating for an accelerated pace of urbanization to promote mechanized production through an increase in per capita agricultural land. Furthermore, the article emphasizes the need to enhance the quality of labor through training and a shift in labor attitudes. Lastly, it underscores the importance of diversifying agricultural development internally and integrating it with industry and services to achieve modern agricultural development.

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