

# Business Model, Current Situation and Development Countermeasures of Maize in Shiyan City, Hubei Province

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**Abstract** In order to understand the status of business model and scale business of maize in Shiyan City, Hubei Province, the situation of maize production in 314 households of 6 counties and cities of Shiyan City was investigated in terms of rural basic situation, business models, economic benefits and scale business. Targeting at the actual problems in business models and scale business, corresponding countermeasures of actively promoting the construction of industrialized business mechanism, improving the construction of agricultural infrastructure, strengthening land transfer management and promoting scientific and technological progress and innovation were put forward to provide reference for the future scale development of maize in Shiyan City.

**Key words** Maize (*Zea mays* L.), Business model, Scale, Development strategies, Shiyan City

## 1 Introduction

Maize is the highest-yielding grain crop that is most widely grown in the world<sup>[1]</sup>. China is the second largest maize producer and consumer in the world, second only to the United States. Maize is not only the second largest grain crop in China, but also the main force in China's grain production<sup>[2]</sup>. Shiyan City is located in the hinterland of the Qinba Mountains Area in the middle and upper reaches of the Hanjiang River in northwestern Hubei Province. It belongs to the subtropical monsoon climate. It is suitable for planting spring maize and summer maize, and its planting area and total output rank first in local grain crops<sup>[3]</sup>. The average annual planting area of maize in the city is stable at around 83 330 ha. At present, the focus is on protecting the water quality of the Danjiangkou reservoir area, implementing the "one control, two reductions and three basics", and developing green ecological recycling agriculture to ensure the goal of "clean water to Beijing". The agricultural structure has been greatly adjusted. Tea, tobacco, vegetables, fruits, edible fungi, Chinese herbal medicines and other special products have formed a special regional economic advantage, and a number of leading enterprises and famous agricultural products brands have emerged. This has effectively promoted the large-scale operation of mountain agriculture in Shiyan and has become a powerful driving force for agricultural industrialization in the city<sup>[4]</sup>. In order to ensure the safety of food production, increasing maize production has become an urgent task. With the method of household survey, the business models, the current situation of large-scale operation and the economic benefits

of various business models in the four major counties, one city and one district of Shiyan City were analyzed in this article to explore the most suitable business model and the main factors restricting the large-scale development of maize in Shiyan. In addition, corresponding countermeasures and recommendations were put forward for the future development of maize production, so as to promote the scalization of maize production and provide reference for the development of the entire maize industry.

## 2 Production and operation status of maize in Shiyan City

**2.1 Basic situation of Shiyan City** Shiyan City covers an area of 23 600 km<sup>2</sup> and governs 4 counties, 1 city, 5 districts, 106 townships and 1 857 villages. The total population is 3.5 million. Among them, the agricultural population is 2 464 000 and quantity of labor force is 1 509 000. The area of cultivated land is 205 500 ha and the area of waters is 100 666.67 ha. The area of mountains above the altitude of 500 m accounts for 73.6% of the entire land area. The mountainous features are very prominent. There is a saying that 80% is mountains, 10% is water and the rest is cultivated land. The region has both northern and southern climate, with obvious three-dimensional features, suitable for maize growth. The perennial planting area of maize is 83 330 ha, accounting for 40.55% of the cultivated land area. It is one of the three major grain crops. The planting area of maize in the 4 counties, 1 city and 1 district is about 82 350 ha, accounting for 99% of maize planting area in the entire city. In 2014, the total area increased slightly by 0.65% compared with 2013, and the average yield of the two years was around 4 593.00 kg/ha, lower than the average yield (4 646.25 kg/ha) in Hubei Province. In 2013, it was 113.25 kg/ha lower than the average yield (4 751.25 kg/ha) of Hubei Province; and in 2014, it was 11.25 kg/ha higher than the average yield (4 571.25 kg/ha) of Hubei Province. The

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planting area of maize under the business model of single-family business accounts for 99% of the total, and that of maize under the business models of enterprise plus farmer, family farm, large grain grower, and cooperative plus farmer accounts for less than 1%. There were 1 216 households under the latter four large-scale business models in 2013, and this number increased to 1 740 in 2014, increased by 43%.

## 2.2 Sample survey of business model and scale operation of maize in Shiyan City

In August 2015, a questionnaire survey was conducted on business models and large-scale business of maize among 314 households in 16 villages of Anyang, Daliu, Liudong, Baisang and Nanhua of Yunyang District, 13 villages of Chengguan, Jianchi, Xiangkou, Shimen and Guanyin of Yunxi County, 7 villages of Tucheng, Hongta and Savage Valley of Fang County, 18 villages of Qingu, Boafeng, Yishui, Leigu and Loutai of Zhushan County, 8 villages of Shuiping, Longba, Zhongfeng and Jiangjiayan of Zhuxi County, and 8 villages of Xijiadian, Haping and Tuguanya of Danjiangkou City. The production situation of maize in the above villages in 2013 and 2014 was surveyed.

The results of the sample survey showed that in the six counties (district & city), maize was mainly planted in mountainous areas; the education level of the farmers was dominated by primary school and junior high school (a small number of the farmers have a education degree of high school); the farming models were dominated by artificial cattle farming, supplemented by semi-mechanization; the employment models were dominated by family labor; and most of the family income came from migrant workers. The business models of maize included single-family operation, large grain grower, family farm, enterprise plus farmer. Among them, single-family operation was the dominant, reaching 260 households. The number of households under the business model of

large grain grower ranked second, with 30 households. There were 18 households following the business model of enterprises plus farmer. The number of households under the business model of family farm was the smallest (six households) (Table 1).

As shown in Table 2, the scale operation of maize in Shiyan City is still immature. The number of households with planting area ranging from 0.067 to 0.67 ha was the highest, reaching 221 households. The number of households with planting area of 0.67 – 1.33 ha, 1.33 – 2.67 ha, 3.33 – 5.33 ha and above 5.33 ha were 54, 29, 6 and 4, respectively. The number of households willing to increase the area of grain production was 24 more than the number of households who were unwilling to increase the area of grain production. The number of households who were unwilling to become large grain growers was 48 more than those who were willing to become large grain growers. The number of households who were unwilling to transfer contracted land was 24 more than the number of households that were willing to transfer contracted land. The number of households engaged in the large-scale business model of "other" was the largest (214 households), and they might be under the single-family business model. The number of households under the model of land transfer family farm was the second largest (54 households), which was 25.2% of the quantity of households under the single-family business model. The number of households under the farmland custody service ranked the third largest (40 households), which was 18.7% of the number of households under the single-family operation. There were 5 households driven by scientific research bases, and it was 2.4% of the number of single-family operations. The number of households involved in land-shared collectives was the smallest (only one household) (Table 2).

**Table 1 Sample survey results of business models of maize in six counties (city/district) of Shiyan City**

County/City	Number of households surveyed	Single-family operation	Enterprise plus farmer	Cooperative plus farmer	Family farm	Large grain grower	Others
Yunyang District	51	18	18	0	2	13	0
Yunxi County	50	50	0	0	0	0	0
Danjiangkou City	57	46	0	0	2	9	0
Fang County	57	50	0	0	2	5	0
Zhushan County	50	48	0	0	0	2	0
Zhuxi County	49	48	0	0	0	1	0
Total	314	260	18	0	6	30	0

## 2.3 Benefit analysis under different business models

**2.3.1 Yield.** In 2013, among different business models, the yield of maize ranked as single-family operation > large grain grower > family farm > enterprise plus farmer, and the maximum difference in yield reached 1 884 kg/ha. In 2013, the maximum difference in yield among the four business models was smaller than that in 2013, only 976.5 kg/ha. The yield was in the order single-family operation > large grain grower > family farm > enterprise plus farmer. In 2014, the yield under the business models of single-family operation, enterprise plus farmer and family farm was increased by 1.9%, 21.0% and 10.1%, respectively, while the

yield under the business model of large grain grower was reduced by 2.5% compared with that in 2013 (Table 3).

**2.3.2 Input cost.** In 2013, the annual input cost among different business models ranked as large grain grower > enterprise plus farmer > single-family operation > family farm, and the maximum difference in annual input cost was 1 263 yuan/ha. In 2014, the annual input cost ranked as enterprise plus farmer > large grain grower > family farm > single-family operation, and the difference in the maximum and minimum input costs was 912 yuan/ha. In 2014, the annual input cost under the business model of enterprise plus farmer was increased by 7.1%, and the annual input costs

under the business models of single-family operation, large grain grower and family farm were reduced by  $-2.2\%$ ,  $-4.3\%$  and  $-0.2\%$ , respectively compared with those in 2013 (Table 3).

**Table 2 Sample survey results of large-scale business of maize in six counties (city/district) of Shiyan City**

County/City	Area//ha					Whether to increase planting area or not		Whether to become large grain grower or not		Whether to transfer contracted land or not		Large-scale production and business models				
	0.067 – 0.67	0.67 – 1.33	1.33 – 2.67	3.33 – 5.33	> 5.33	Willing	Unwilling	Willing	Unwilling	Willing	Unwilling	Land share collective type	Land transfer family farm	Scientific research base driving type	Farmland custody service type	Other
Yunyang District	14	12	17	5	3	37	14	36	15	20	31	0	12	0	0	39
Yunxi County	50	0	0	0	0	33	17	11	39	14	36	0	0	0	0	50
Danjiangkou City	22	24	10	1	0	35	22	28	29	31	26	0	18	3	2	34
Fang County	55	1	0	0	1	14	43	17	40	36	21	0	1	0	0	56
Zhushan County	42	7	1	0	0	22	28	15	35	20	30	1	9	2	38	0
Zhuxi County	38	10	1	0	0	28	21	26	23	24	25	0	14	0	0	35
Total	221	54	29	6	4	169	145	133	181	145	169	1	54	5	40	214

**Table 3 Economic benefit analysis of four business models of maize in six counties (city/district) of Shiyan City**

Business model	Single-family operation (average per household)		Large grain grower (average per household)		Enterprise plus farmer (average per household)		Family farm (average per household)		
	2013	2014	2013	2014	2013	2014	2013	2014	
Area//ha	0.06	0.06	1.67	2.05	0.65	0.87	6.2	7.37	
Yield//kg/ha	6 823.5	6 951	6 417	6 253.5	4 939.5	5 974.5	5 670	6 240	
Output value//yuan/ha	14 781	15 747	14 116.5	14 976	12 766.5	15 657	12 474	14 976	
Government subsidy//yuan/ha	802.5	969	0	0	756	564	0	0	
Inputs//yuan/ha	Fertilizers	1 836	1 897.5	1 900.5	1 800	1 693.5	1 875	1 335	1 770
	Pesticides	342	315	408	345	159	180	192	243
	Seeds	796.5	750	684	795	808.5	880.5	654	735
	Land rental	0	0	1 500	1 500	0	0	2 250	2 250
Labor inputs//yuan/ha	Labor	4 627.5	4 546.5	4 266	3 690	5 260.5	5 329.5	1 980	1 380
	Machinery	945	1 435.5	1 383	1 590	1 170	1 488	2 430	2 310
	Water and electricity	739.5	133.5	291	256.5	240	235.5	330	465
Total input//yuan/ha	9 286.5	9 078	10 434	9 984	9 330	9 990	9 171	9 153	
Profit//yuan/ha	6 295.5	7 638	3 684	4 992	4 192.5	5 668.5	3 303	5 823	

**2.3.3 Economic benefit.** In 2013, the profit per hectare was in the order single-family operation > enterprise plus farmer > family farm > large grain grower. The profit per hectare under the business model of single-family operation was 1.5, 1.71 and 1.91 times higher than those under the rest three business models. In 2014, the profit per hectare was in the order single-family operation > family farm > enterprise plus farmer > large grain grower, and the profit per hectare under the business model of single-family operation was 1.31, 1.35 and 1.53 times higher than those under the rest three business models. Under the four business models, the profit per hectare in 2014 increased compared with that in 2013 (single-family operation, 21.3%; large gain grower, 35.5%; enterprise plus farmer, 35.2%; family farm, 76.3%) (Table 3).

### 3 Analysis of survey results

According to the statistics of the Municipal Agriculture Bureau, the planting area and yield of maize in Shiyan City increased year by year in 2010 – 2014. The planting area was increased from 81 480 ha to 83 160 ha, increased by 2.1%; and the yield ranged between 4 500 and 4 605 kg/ha. The proportion of households un-

der the business model of single-family operation was still the highest, 83%; and the households under the business models of enterprise plus farmer, large grain grower and family farm accounted for only 17% of the total. It indicated that the degree of scale business of maize in Shiyan City was extremely low. In terms of efficiency, the single-family operation had high efficiency. However, its area was small, and the area per household was less than 0.067 ha. Single-family operation is characterized with intensive labor, intensive cultivation, self-owned land, high yield and good profit. But, its scale is small. The income of grain is less than 20% of household income. The main source of income is that the main labor force goes out to work. The planting area of the business model of enterprise plus farmer ranged from 0.067 to 0.67 ha. It belongs to order agriculture, and land lease fees can be saved (provided by enterprises). There are uniform specifications for planting varieties and technologies. The purchase price is slightly higher than others, and the profit is relatively stable. The grain income can reach 20% of the household income. The main labor force can go out to work and be engaged in other sideline during the slack season. Family farm (more than 10 ha) and large grain grower (3.33 ha or

more) have a large average area. They are dominated by semi mechanization. Management is extensive. Land lease fees need to be paid. Thus, the output value per hectare is relatively low. However, their scale degree is high. Grain income accounts for 70% of household income. Labor can be employed on the spot. In terms of income per household, there were great differences among the four business models (single-family operation < enterprise plus farmer < large grain grower < family farm). The larger the planting area per household is, the higher the household income is, and the more significant the difference is. The growth rate of profits of family farm reached 76%, and those of large grain grower and enterprise plus farmer also reached more than 35%. The growth rate of profits of single-family operation was the lowest. It indicates that only management and technology are improved, large-scale operations will greatly increase their potential and profits. However, the traditional single-family business model has little potential for increasing production efficiency and operating efficiency.

In terms of radiation capacity, the driving force of efficient business models of maize was relatively insufficient. Although the planting area of maize under the business models of enterprise plus farmer and large grain grower was increased in 2013 and 2014, the number of households involved in these two business models was small. Only driven by efficient business models can the large-scale division of labor be realized among scattered farmers, large growers and farms, and can the effective connection with the market mechanism be smoothly realized, thereby ensuring the stable interests of farmers.

## 4 Constraints on business and scalization of maize

**4.1 Insufficient labor, old age and low education level** The survey found that the average household size was 5 people and the average age of household farming was over 50 years. The level of education was concentrated in primary and junior high schools, accounting for more than 90%. The production and management of maize was still extensive, with relatively small investment in capital and technology and original labor input. Due to the tight land, the scale of operation was limited. Moreover, the level of production technology was not advanced, and the quality of maize was not high, resulting in low agricultural management efficiency in these areas. The enthusiasm of farmers declined. At the same time, the survey found that among the main sources of income of farmers' households, grain income only accounted for 28.62%, out-of-work income accounted for 31.80%, and other sources accounted for 39.58%. This also shows that the level of production and management needs to be further improved to ensure maize production.

### 4.2 Barren cultivated land and low degree of mechanization

With the implementation of the project of South-to-North Water Diversion and the policies of returning farmland to forests and afforestation, some low mountains and river beaches cannot be converted into farmland, resulting in a reduction in the area of cultivated land<sup>[5]</sup>. The cultivated land is mostly scattered and difficult to operate on a large scale. The quality of the cultivated land is relatively poor, with large slope, shallow plough layer, thin soil layer

and low organic matter content, affecting crop yield and quality. In addition, the cultivated plots in the mountains are generally small and have different shapes. Agricultural machinery is inefficient in mountainous areas. This situation has made the transformation of science and technology into labor more difficult, seriously restricting the in-depth implementation of agricultural mechanization<sup>[6]</sup>.

### 4.3 Weak agricultural infrastructure and difficult land transfer

The irrationality of the rural industrial structure is largely directly related to the unsuitability of rural water conservancy and electric power facilities and the backwardness of production conditions. Insufficient investment in rural infrastructure construction has led to the backwardness and aging of agricultural infrastructure, making it difficult to provide sustained protection and promotion for agricultural production. The ability of agriculture to resist natural disasters has also fallen sharply. In addition, the cultivated plots in mountainous areas are generally small, and the contiguous area is not large, making the land transfer difficult. The existing grain production and management forms in Shiyuan City are mostly farmers' own contracted land and land transfer family farms. Farmers have many concerns about the transfer of land, and they worry that the land will be lost after the land is transferred. Moreover, land rental costs are low. Some farmers even prefer abandoning land to renting it. Most unemployed families choose to lend land to relatives for cultivations. Large grain growers and family farms hope to expand their acreage to increase their income. Thus, a conflict between demand and supply is produced.

### 4.4 Increased production costs and difficult business financing

Studies have shown that agricultural production, especially food production in Shiyuan City is entering an era of high cost and high investment. The remaining elderly and women in rural areas, due to lack of cultural and scientific knowledge, still carry out field cultivation and management in accordance with the methods of the 1980s, and the potential for yield growth is small. The rise in production costs has become a bottleneck restricting agricultural development and farmers' income in Shiyuan City. At the same time, the farmers surveyed generally reflect that the biggest factor affecting the scale of grain production is financial difficulties. The main channel for rural household loans is rural credit cooperatives, with narrow financial channels, low amount, short period and high loan interest rate.

### 4.5 Imperfect agricultural insurance system

The agricultural insurance system is not perfect, and farmers face multiple risks, especially both natural and market risks. Shiyuan City is located in the north-south handover area. In recent years, the ecology of Shiyuan City has changed and natural disasters have occurred frequently. Moreover, under the current market economic system, prices often change, and farmers' corresponding insurance policies are not in place. Insurance categories are insufficient and their coverage is low. Agricultural insurance claims are low. In addition, due to the quality of farmers themselves and the lack of effective agricultural product price information, they have no correct analytical ability for market circulation. Sales prices are unstable, and farmers often carry out production and sales blindly, ultimately leading to heavy loss.

## 5 Countermeasures for scale development of maize business

### 5.1 Actively promoting the construction of maize industrialized business mechanism and protecting the enthusiasm of farmers

First of all, the traditional small inefficient development model of maize must be abandoned, and farmers should actively participate in the process of industrial production and management. The industrialization of maize will be promoted through guidance to promote the industrialization of maize. Focus will be paid on the coordinated promotion of production, processing and scales. A standard mechanism needs to be established. The propaganda and macro-control role of local government will be brought into play, and some support policies will be announced<sup>[7-9]</sup>. Second, interest protection and operational mechanism should be established as soon as possible to form an institutional atmosphere conducive to agricultural industrialization. In order to protect the basic rights and interests of farmers, it is necessary to establish a reasonable operational mechanism and interest guarantee mechanism for the transfer of property rights and management rights<sup>[10]</sup>. Third, policy control should be strengthened to protect the enthusiasm of farmers. In recent years, the state has started the temporary storage policy for maize in due course, which plays an important role in stabilizing the market price of maize, maintaining reasonable income of farmers and ensuring the planting area of maize. Fourth, the agricultural insurance system should be improved. Various types of agricultural insurance can be developed according to local conditions, and the coverage of the insurance system needs to be expanded to reduce the risk of maize production.

### 5.2 Improving agricultural infrastructure construction and improving production conditions

Investment in agricultural infrastructure construction needs to be increased. Starting from the place with the worst conditions and the most urgent needs, small-scale farmland water conservancy construction, power grid reconstruction, road construction, and technology promotion will be incorporated into the infrastructure construction. The field projects such as transforming slopes into terraces, changing barrenness into fertility and transforming non-cultivated land with development conditions will be promoted steadily. For the construction of rural infrastructure, it is necessary to implement maintenance responsibility and quantify it to people. Funds will be invested subsequently for maintenance and management. It is strictly forbidden to destroy, pollute, occupy idle arable land and damage farmland infrastructure. Thus, production conditions will be improved fundamentally and play a long-term benefit.

### 5.3 Strengthening land transfer management and promoting large-scale development

To ensure the long-term stable development of large-scale operation of mountain maize requires the complete transfer of household contract management rights. The development of land transfer policies must reflect this feature<sup>[11]</sup>. Management of land transfer needs to be strengthened and guided. The scope of land transfer and the use of land transfer require scientific planning to meet the needs of the development of the maize industry in Shiyang City, so that the land will be concentrated to large grain growers and to mechanical, large-scale and intensive

farming, thus improving the commercialization of food. Reasonable compensation policies need be formulated, and a two-way agricultural transfer subsidy system needs to be established. Currently, government subsidies for promoting large-scale agricultural operations are limited to large agricultural operators and integrated land-owners. Although this unilateral subsidy policy helps to encourage some farmers or other operators to participate in land scale operations, the resistance to achieve centralized agricultural land is still relatively large. When formulating a land transfer subsidy policy, it is necessary to make appropriate subsidies for the owners of land. In addition to rental income of the transferred land, corresponding government reward will be also obtained, inspiring farmers who have concerns about land transfer or are not satisfied with land transfer rental income to rent their land. This policy will help the land concentration and some farmers completely get rid of agriculture, achieving a win-win situation<sup>[12]</sup>. The specific measures are as follows. First, publicity and education can be strengthened. The government can organize agricultural technicians to personally explain the country's land transfer policy, solve doubts, eliminate the concerns the farmers, and make the land transfer healthy and orderly. Second, the collective ownership of rural land must be adhered to, the contractual rights of farmers must be stabilized, and the right to operate land can be released. Based on family contract management, the common development of various farm management methods such as family farm, cooperative, enterprise and large grain grower will be promoted. The third is to persist in taking reform as the driving force, give full play to the pioneering spirit of the peasants, encourage innovation, support the grassroots to try first, and resolve development problems by reform. Fourth, a moderate scale of operations will be insisted on. Focus will be paid on preventing excessive concentration of land, as well as improving the scale of land management. Efficiency and fairness will be both taken into account. Labor productivity, land output rate and resource utilization rate will be improved continuously. Agricultural land must be used for agriculture. More support will be given to the development of large-scale grain production.

### 5.4 Promoting scientific and technological progress and innovation and improving the quality of the workforce

The combination of modern science and technology and agricultural production is a major breakthrough in liberating rural productivity and comprehensively improving labor productivity. Agricultural mechanization in developed countries has already announced to the world that the use of science and technology has played a huge role in expanding the scale of agricultural production and management and improving the economic benefits of agriculture<sup>[6]</sup>. First, mechanization must be developed vigorously. Mechanical land preparation and precise seeding of maize, and the integration of agricultural machinery and agronomy should be promoted actively. The promotion of mechanical harvest of maize is the focus of promotion of full mechanization of maize production. The development of key technologies for maize harvesting and the development of implements suitable for mountain agriculture can be organized, introducing new products, new technologies, and new equipment continuously<sup>[13]</sup>. The role of mechanical harvest of saving time and reducing loss will be fully played to solve the problems in harvest of

maize. The government can help farmers update their production equipment through price concessions and price subsidies to facilitate expanding the scope of use of agricultural machinery. Second, it is necessary to adjust the planting structure. According to the area of maize production, the planting structure can be adjusted and optimized according to local conditions and classification guidance. For example, in the fields in hilly areas, river valleys and floodplains with flat terrain, warm climate and abundant sunshine, the main cultivation modes such as wheat/maize + soybean, rape/maize + soybean, radish/maize/sesame, spring maize/autumn maize/cabbage, and potato/maize/sweet potato can be promoted. In the high-altitude shadow areas with cold climate and insufficient light and heat resources, mulching technology and early sowing technology can be promoted. Demonstration zones can be built in different types of ecology to drive large-scale popularization of maize integrated supporting production technology. Thus, production and income of farmers will be increased<sup>[14]</sup>. Third, a scientific layout is required to drive the industrialization of maize with the construction of bases. At present, Shiyan City has realized the comparative advantages of the region in tobacco, tea, fruits, edible fungi and Chinese herbal medicines. A number of bases have been established in some counties and cities to form a one-step service of cultivation, management, acquisition and sales. On this basis, the construction, investment and support of food crops should be further strengthened and expanded. Production and scales will be driven by production. Also, joint production bases can be established based on the industrial linkage between maize and other crops to form mutual promotion role. Fourth, the policy support for maize processing enterprises needs to be increased to cultivate well-known brands. The maize processing products and enterprises in Shiyan City are relatively scarce. Under the premise of meeting the eating demand of maize, the healthy development of the maize processing industry will be guided and promoted though policy support to expand the regional influence of maize processing enterprises. A production and scales network will be established to provide one-step service for production, processing and sales of maize. Order production can be implemented to effectively solve the sales problems of farmers and avoid blindness. The management of maize production enterprises should be strengthened. The relationship between the enterprises and the farmers should be established actively, and the processing of maize agricultural products needs to be expanded to increase profits. Fifth, targeted training of planting techniques and skills can be carried out to comprehensively improve farmers' utilization of agricultural science knowledge, new technologies, new measures, and new agronomy. Relying on the agricultural research, technology promotion and agricultural education departments of Shiyan City, agricultural tech-

nology training courses or on-spot technical guidance and training can be developed. As a result, the scalization of production and management, the application and promotion of excellent seeds and good methods, the productivity of land, and the scientific and technological quality, management quality and market quality of farmers will be improved continuously.

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