Agricultural Investment Environment in Shaanxi Province

YANG Tian-rong *

School of Management Engineering, Xi'an University of Finance and Economics, Xi'an 710100, China

Abstract The features of ageing, low educational level and female domination on the part of agricultural labor forces, determine that the sustainable development of agriculture can not rely entirely on farmers, who are engaged in dispersed planting and small-scale operation, therefore, improving agricultural investment environment, and taking positive measures to promote diversification of the main body of agricultural investment, is the key to the healthy development of agriculture. From four aspects (the industrial base of agriculture, arable land resource conditions, capital investment capacity, input of means of production), this article establishes evaluation indicator system of agricultural investment environment in Shaanxi Province, and based on this, make recommendations for improvement of agricultural investment environment in Shaanxi.

Key words Shaanxi's agriculture, Investment environment, Evaluation system

The per capita area of arable land in Shaanxi Province is small, and in the context of taking household as production unit, vast population and limited farmland make it difficult to form scale cultivation, therefore, the benefit generated by the land can only ensure the basic living, rather than income growth. It is estimated that by relying on land, the average annual income of one household is less than 10 000 yuan, but working elsewhere can bring them the annual per capita income as high as 20 000 -30 000 yuan. Consequently, in villages of Shaanxi Province, there are young labor forces basically in each household working outside, leaving the elderly or women who are engaged in farming at home, forming the production pattern of working outside and farming complementing each other. Whole family even work away from home, and the consumer spending is totally dependent on wage income. The objective reality of low agricultural benefit makes the farmers show not much interest in investment in agriculture, and they are just engaged in extensive planting. The area of farmland is dwindling in rural areas of Shaanxi Province, and the quality of farmland is deteriorating. Farmers' will to engage in agriculture has increasingly become an indisputable fact. The technological and cultural quality of farmers, who are truly engaged in agricultural production and operation at present, is generally low. The female getting old are the majority, lacking strong ability to accept and apply technology. Consequently, some cannot engage in farming for want of farmland; some do not farm; some are not willing to farm; some do not seriously farm or are unable to farm. These phenomena are widespread, leading to reduced supply of agricultural products. However, the demand of population consumption and industrial production for agricultural products is mounting increasingly. Since 2003, the average annual consumption of food in Shaanxi Province has steadily increased by 5%, but the growth rate of grain yield averages 3%, and in some years, even negative growth occurs. In 2009, the province's social food consumption increased by 3.2% over the previous year; the proportion of grain for industry and grain for feed continued to increase; the food supply and demand gap gradually tended to be expanded. In 2010, 30% of wheat, 50% of rice, and 70% of edible oil in whole province needed to rely on outsourcing to meet the demand.

Agriculture is China's basic industry, related to people's living standards and national security. In the context of the rural labor forces transferring to urban areas, the features of ageing, low educational level and female domination on the part of agricultural labor forces, determine that the sustainable development of agriculture can not rely entirely on farmers, who are engaged in dispersed planting and small-scale operation, therefore, specialized agricultural production and large-scale operation is the key to achieving the modernization of agriculture. With the evolution of the structure of agricultural investment, the agricultural production cooperatives with clear definition of property right, professional farmers, and agricultural production enterprises should become the main body of agricultural investment. Therefore, evaluating and improving agricultural investment environment is the key to enhancing diversification of the main body of agricultural investment, and promoting sustainable and healthy development of agriculture.

1 Data source and research methods

1.1 Data source The data are from *Shaanxi Statistical Yearbook*.

1.2 Establishment of evaluation indicator system of agricultural investment environment in Shaanxi Province The investment environment exists, changes and develops around the main body of investment, including various natural, technological, economic and social conditions influencing and restricting the investment activities and results[1]. Evaluation and opti-

Received: January 5, 2012 Accepted: March 23, 2012
Supported by Foundation of Shaanxi Provincial Department of Education Research Project (11JK0154)
* Corresponding author. E-mail: yangtianrong810@163.com

mization of agricultural investment environment can help the main body of investment to rationally choose investment location and investment projects, and reduce investment risk.

In theory, with the increase in the number of evaluation indicators of investment environment, the comprehensive indicator system can obtain more comprehensive and accurate evaluation results, but in the same administrative region, there is not much difference in the administrative environment (social politics, law, economics, culture, idea, custom, and habit), legal environment, human environment and other soft environments, therefore, the such class of indicators are not selected in this article.

Because of restrictions on statistics and computing, it is difficult to use all kinds of indicators into the indicator system, so from the special nature of agricultural production, combined with the availability of statistics, this article selects 14 indicators from 4 sub-systems (the industrial base of agriculture, farmland resources endowment, investment capacity of capital, and input of means of agricultural production) as evaluation indicator system of agricultural investment environment in Shaanxi Province, as shown in Table 1.

Table 1 Evaluation indicator system of agricultural investment environment in Shaanxi Province

The target layer A	Sub-system layer B	Indicator layer C
Agricultural investment environment in Shaanxi Province A	The industrial base of agriculture B_1	Output value of the primary industry (10^4 yuan) C_1
		Output value index of the primary industry C_2
		The added value of agriculture, forestry, animal husbandry and fishery (10^4 yuan) C_3
		The growth rate of total output value of agriculture, forestry, animal husbandry and fishery C_4
	Farmland resource conditions B_2	The area of farmland at the end of year (hm^2) C_5
		The area of land occupied by people in each village(hm^2) C_6
		Effective irrigation area (hm^2) C_7
		The area of farmland with high yields irrespective of drought or water logging(hm^2) C_8
	Investment capacity of capital B_3	Investment in agriculture, forestry, animal husbandry and fishery(104 yuan) C_9
		Urban residents' disposable income (yuan) C_{10}
		Rural per capita net income (yuan) C_{11}
	Input of means of production B_4	Application rate of chemical fertilizer (t) C_{12}
		Application rate of plastic film for agriculture(t) C_{13}
		Total power of agricultural machinery(10^4 kw) C_{14}

1.3 Evaluation methods of agricultural investment environment in Shaanxi Province

1.3.1 Standardization of indicator data. There are many kinds of standardization methods of indicators, and this article selects the efficacy coefficient method. Given that after standardized processing of the efficacy coefficient, there might be the extreme value of "0" in the indicator values, and many weight calculation methods can not be applied directly such as entropy method, but in order to ensure data integrity, these values can not be deleted, therefore, we need to transform these indicator data and further improve the efficiency coefficient as follows:

$$d_i = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}} \times \alpha$$

After improvement, we process the extreme value to some extent, eliminate the problem of "zero value" of the indicator value, and conduct the weight calculation. Taking different α might cause different evaluation results, but it doest not affect the overall trend of sequencing. In this article, we take $\alpha = 0.5$. According to the characteristics of relationship between various indicators and the investment environment, the indicators selected in this article are positive indicators.

1.3.2 Methods for determining indicator weight. In order to ensure the objectivity of weight determining, this article adopts the entropy method to determine the indicator weight.

The concrete steps of calculating the indicator weight using entropy method are as follows[2]:

First, standardizing all indicator data.

Second, calculating the proportion p_{ij} of the indicator value of program i under indicator j as follows:

$$p_{ij} = X_{ij} / \sum_{i=1}^{m} X_{ij} \quad (1)$$

Third, calculating the entropy value e_j of indicator j as follows:

$$e_j = -k \sum_{i=1}^{m} p_{ij} \ln(p_{ij}) \quad (2)$$

where $k = 1/\ln m$.

Fourth, calculating variation coefficient g_j of indicator j as follows:

$$g_i = 1 - e_j \quad (3)$$

Fifth, determining the weight a_j:

$$a_i = g_j / \sum_{j=1}^{n} g_j \quad (4)$$

1.3.3 Calculation of overall evaluation value of agricultural investment environment in Shaanxi Province. As to the evaluation method of agricultural investment environment in Shaanxi Province, we adopt the comprehensive index evaluation method of investment environment.

The comprehensive index of all regions is as follows:

$$DS_i = \sum_{j}^{n} a_j X_{ij} \quad (5)$$

where the weight of indicator layer C relative to the target layer A is marked as a_j; n is the number of term of evaluation indicator.

2 Analysis of evaluation results of agricultural investment environment in Shaanxi Province

2.1 Evaluation results of agricultural investment environment in Shaanxi Province According to the evaluation indicator system of agricultural investment environment in Shaanxi Province, we standardize all indicator data using the data in *Shaanxi Statistical Yearbook in* 2009. The indicator weight of the indicator layer relative to the target layer using the entropy method can be seen in Table 2, and the score and ranking results of agricultural investment environment in regions of Shaanxi Province are obtained by calculation, as shown in Table 3.

Table 2 The weight of evaluation indicator of agricultural investment environment in Shaanxi Province

The target layer A	Sub-system layer B	Indicator layer C
The agricultural investment environment in Shaanxi Province (1)	The industrial base of agriculture (0.25)	Output value of the primary industry (0.069)
		Output value index of the primary industry (0.062)
		The added value of agriculture, forestry, animal husbandry and fishery (0.065)
		The growth rate of total output value of agriculture, forestry, animal husbandry and fishery (0.054)
	Farmland resource conditions (0.322)	The area of farmland at the end of year (0.067)
		The area of land occupied by people in each village (0.078)
		Effective irrigation area (0.077)
		The area of farmland with high yields irrespective of drought or water logging (0.1)
	Investment capacity of capital (0.224)	Investment in agriculture, forestry, animal husbandry and fishery (0.064)
		Urban residents' disposable income (0.09)
		Rural per capita net income (0.07)
	Input of means of production (0.205)	Application rate of chemical fertilizer (t) (0.074)
		Application rate of plastic film for agriculture(t) (0.062)
		Total power of agricultural machinery (0.069)

Table 3 Ranking of evaluation results of agricultural investment environment in Shaanxi Province in 2009

Region	The industrial base of agriculture		Farmland resource conditions		Investment capacity of capital		Input of means of production		Integrated environment	
	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking
Xi'an	0.200	4	0.247	4	0.219	1	0.163	3	0.828	2
Tongchuan	0.167	8	0.190	9	0.133	8	0.113	10	0.602	9
Baoji	0.175	7	0.245	5	0.169	3	0.150	5	0.738	5
Xianyang	0.215	2	0.248	3	0.168	4	0.179	2	0.809	3
Weinan	0.194	5	0.300	1	0.138	7	0.204	1	0.836	1
Yan'an	0.156	9	0.208	7	0.149	5	0.143	6	0.656	7
Hanzhong	0.210	3	0.214	6	0.126	10	0.138	7	0.678	6
Yulin	0.231	1	0.266	2	0.146	6	0.158	4	0.802	4
Ankang	0.182	6	0.194	8	0.130	9	0.132	8	0.639	8
Shangluo	0.147	10	0.180	10	0.122	11	0.119	9	0.569	11
Yangling	0.129	11	0.161	11	0.189	2	0.102	11	0.582	10

From the composite score of the agricultural investment environment in Shaanxi Province, the agricultural investment environment in Shaanxi's Weinan gets the highest score, followed by Xi'an and Xianyang; Yulin, Baoji, Hanzhong, Yan'an, Ankang and other areas are in the middle of the ranking; Tongchuan, Shangluo, and Yangling rank poorly.

From the subsystem, we can find that the ranking of all regions changes.

The subsystem of the industrial base of agriculture includes four indicators (the total output value of the primary industry, index of the total output value of the primary industry, value added of farming, forestry, animal husbandry and fishery, and the growth rate of the total output value of farming, forestry, animal husbandry and fishery). These indicators reflect the degree of potential for investment in agriculture and scale operation of agriculture. The regions with the highest score are Yulin, Xianyang, Hanzhong, Xi'an, and Weinan in order; the regions with the lowest score are Yan'an, Shangluo, and Yangling.

The subsystem of farmland resource conditions consists of four indicators, namely, the area of cultivated land at the end of year, the area occupied by population in each village, effective irrigation area, the area of farmland with high yields irrespective of drought or water logging, reflecting the resource endowment conditions of engaging in agriculture. The agricultural production is affected greatly by natural conditions, and the investors are highly concerned about this factor. Table 3 shows that the regions with high score in farmland resource conditions include Weinan, Yulin, Xianyang, Xi'an, Hanzhong; the regions with low score in farmland resource conditions include Ankang, Tongchuan, Shangluo, Yangling.

The subsystem of investment capacity of capital includes

three indicators, namely, the amount of investment in agriculture, forestry, animal husbandry and fishery, urban residents' disposable income and rural per capita net income. Investment needs capital, and the three indicators reflect the possibility of realization of the investment from the perspective of fund raising. The regions with high score in investment capacity of capital include Xi'an, Yangling, Baoji, Weinan, Xianyang, and Yan'an; the regions with low score in investment capacity of capital include Tongchuan, Ankang, Hanzhong and Shangluo.

The subsystem of input of means of production includes three indicators, namely, application rate of chemical fertilizer, application rate of plastic film for agriculture and total power of agricultural machinery. This item reflects the conditions for agricultural production and the mode of agricultural production, thereby determining the output value of agriculture in Shaanxi Province. The regions with high score in input of means of production include Weinan, Xianyang, Xi'an, and Yulin; the regions with low score in input of means of production include Ankang, Shangluo, Tongchuan, and Yangling.

2.2 Analysis of strength and weakness of agricultural investment environment in regions of Shaanxi Province and improving measures Due to differences in natural conditions, geographical location and speed of economic development, there are differences in agricultural investment environment between regions of Shaanxi Province. From the evaluation results of agricultural investment environment in Shaanxi Province, we can find that the scores of factors influencing investment environment in various regions vary, and in order to stay ahead in the competition, all regions must make the best use of the advantages, supplement insufficiency, continuously optimize and improve the investment environment.

In Weinan, Xi'an, and Xianyang, three regions with excellent investment environment, they need to continue to strengthen the construction of agricultural investment environment, maintain its leading position. The farmland resource conditions in Weinan are good, and the level of input of means of production in Weinan is high, ranking first in Shaanxi Province, but the industrial base of agriculture, and investment capacity of capital in Weinan are poor, ranking fifth and seventh, respectively, therefore, it should pay attention to the industrial status of agriculture, and increase funds to support investment in agriculture. The investment capacity of capital in Xi'an is strong, ranking first, and the level of input of means of production is high, ranking third, but the farmland resource conditions in Xi'an are poor, only ranking fourth. With the formation of big Xi'an in the future, vast rural land is in face of expropriation, thus it should make scientific planning of layout of urban construction, reasonably divide the agricultural functional areas, and protect agricultural land. The average level of various indicators in Xianyang City is good: the industrial base of agriculture, and input of means of production rank second, farmland resource conditions, investment capacity of capital rank third and fourth, respectively. Each system basically has the trend of balanced development, and Xianyang should continue to maintain the pattern of balanced development.

Five cities, Yulin, Baoji, Hanzhong, Yan'an, and Ankang, should continue to strengthen the construction of dominant factors of investment environment, and improve the negative factors at the same time. The value added of agriculture, forestry, animal husbandry and fishery in Yulin is increased and the output value of the primary industry is the highest, which is conducive to promoting the generation of motivation of investment in agriculture, but investment capacity of capital in Yulin is poor, only ranking sixth, thus it should focus on strengthening the construction of agricultural investment and financing system. The investment capacity of capital in Baoji ranks third, but the industrial base of agriculture only ranks seventh, thus in the process of economic development, it should consolidate the industrial status of agriculture.

In terms of the industrial base of agriculture, Hanzhong ranks third, but in Hanzhong, the level of input of means of production is low, and investment capacity of capital is weak, ranking seventh and tenth, respectively. Since the urban residents' disposable income and farmers' per capita net income is low, it should focus on attracting funds from outside of the region. In terms of farmland resource conditions and the industrial base of agriculture, Yan'an ranks seventh and ninth, respectively, which is related to its geographical location and topography characteristics, so it should focus on improving the development environment for the characteristic agricultural economy. The industrial base of agriculture in Ankang is relatively good, ranking sixth, but its investment capacity of capital is weak, ranking ninth, with poor investment strength, so it should focus on improving investment strength.

Tongchuan, Shangluo, Yangling, ranking poorly, because their economies are small, with less arable land, and agricultural investment space is restricted. Shangluo should improve the production environment of forest products, according to characteristics of topography; Yangling's investment capacity of capital is strong, ranking second, thus it should focus on improving the demonstration agricultural investment environment.

3 Conclusions and discussions

By the above analysis, we can find that the agricultural investment environment in Weinan, Xi'an, Xianyang, Baoji, located in central Shaanxi Province, is good. This area has a temperate monsoon climate, with moderate rainfall, and a long time of sunshine; there is great difference in the temperature between day and night, creating excellent conditions for fruit production. The soil of Weihe Plain is fertile, which is suitable for planting of grain, cotton, melon, and fruit, as well as animal husbandry and afforestation. Agriculture is based on wheat, corn, oilseeds, vegetables; the production conditions for animal husbandry and fishery is good, which are favorable for the development of agriculture. The major grain – producing counties in Shaanxi Province are mostly concentrated in the Guanzhong area. In recent years, after economic restructuring, the Guanzhong economic area vigorously develops diversified operation model based on grain cultivation, and now it has basically formed the Guanzhong agricultural industrial belt

based on milk yielding animals, Qinchuan cattle, strong gluten wheat, characteristic vegetables, kiwi fruit.

Drought, ditch and hilly have always been a major obstacle to large-scale and efficient development of agriculture in Yulin, but according to the operating mode of "government helping enterprises, enterprises building parks, parks leading farmers, farmers connecting with markets", Yulin introduces private enterprises to establish efficient agricultural demonstration park, and carries out the construction of agricultural infrastructure, such as rainwater harvesting facilities, irrigation facilities, wind break forest, wide paths for tractors in the countryside, wide row of terraces in accordance with the division of zones, effectively improving agricultural investment environment, so that it becomes a an important production base of the famous cereals, potatoes, facility vegetables. Yan'an forms the northern Shaanxi agricultural industrial belt based on white cashmere goat and big jujube.

Shaanxi economic zone includes Hanzhong, Ankang and Shangluo, located in Qinba mountainous area, with land area of 696 000 km^2, accounting for 34% of whole province, and the area of farmland accounts for 20% of that of whole province. In the southern Shaanxi Province, the score of Hanzhong, Ankang and Shangluo is low, but the climate here is warm and humid, with abundant natural resources, and the forest area accounts for more than 66% of the province's forest area. The forest products include lacquer, citrus, Chinese wood oil, walnuts, fungus, mulberry; the precious herbal medicines include bark of eucommia, Gynostemma and gastrodia tuber, thus it should focus on the development of characteristic agriculture. And a land of milk and honey, Hanzhong basin, is also the important grain and oil base in whole province. Southern Shaanxi economic zone has formed southern Shaanxi industrial belt of characteristic agriculture based on herbs, pigs, agriculture, silkworm, tea, edible fungus, and "double low" rape[3].

In terms of the industrial base of agriculture, farmland resource conditions, investment capacity of capital and the level of input of means of production, Tongchuan has no advantages, but it is close to Xi'an, with convenient transportation, and its advantages of geographic location will gradually loom large in the context of ceaseless development of the cities and counties surrounding Xi'an City, therefore, on the basis of continuous development of the fruit industry, it should strive to be the vegetable basket supply base in Xi'an.

Yangling scores little, because its economy is small, but the investment capacity of capital is strong. A great deal of capital-intensive facility agriculture clusters in Yangling which is as the state-level agricultural high-tech industrial demonstration zone. Yangling is limited by the size of economy, making it difficult to attract more investors, but as the promotion base of new technology, new varieties, and new crop modes, it plays a significant role in leading the exploration and innovation of modern agriculture in the province.

References

[1] HUANG D, LIU HR, ZHANG XR. China financial encyclopedia[M]. Beijing: Economic Management Publishing House, 1990. (in Chinese).

[2] ZHAO XP. Assessing the sustainability of a regional agriculture—a case study of Shaanxi Province[J]. Journal of South China Agricultural University: Social Science Edition, 2007, 6(1): 17 -22. (in Chinese).

[3] ZHANG BT, PEI CR. Overview on the west of China[M]. Beijing: Nationalities Publishing House, 2000. (in Chinese).

[4] WANG XR, SUN X. Construction of comprehensive evaluation indicator system of agricultural investment projects[J]. Journal of Anhui Agricultural Sciences, 2011, 39(15): 9324 -9325. (in Chinese).

[5] ZHANG L. Empirical analysis on fixed assets investment and income increase of rural household[J]. Asian Agricultural Research, 2009, 1(4): 1 -4.

[6] CHEN YJ. Study on the current investment status of rural infrastructure construction in west China[J]. Journal of Anhui Agricultural Sciences, 2010, 38(22): 12007 -12010. (in Chinese).

[7] MI BJ. Infrastructure investment and regional economic development in China[J]. Asian Agricultural Research, 2009, 1(4): 21 -26.

[8] ZHAO GH, LIU J. Application of unascertained expectation in the decision-making of agricultural investments[J]. Journal of Anhui Agricultural Sciences, 2010, 38(4): 1657,1670. (in Chinese).

[9] WU DW, TAN JX. An analysis on the disparity of the private investment on human capital between urban and rural residents in Guangxi [J]. Asian Agricultural Research, 2011, 3(6): 21 -24, 30.

(From page 16)

subjects participate in, so as to ultimately promote the development of circular agricultural technology through the joint efforts of the visible hand (government) and invisible hand (market).

3 Conclusion

The circular agriculture is an inevitable choice for sustainable agricultural development, and the role of the government in building the technology system of circular agriculture is important. As the circular agricultural technology has characteristics and externalities of public goods, therefore, the government has also become the important main body of in the development of circular agricultural technology. In the development of circular agricultural technology, the government should play four roles well (leader, designer, organizer and regulator), to ensure that they do not cross the line, but be indispensable all the while.

References

[1] XU Y. Study on technology system constructing under circular economic pattern in China[D]. Changchun: Jilin University, 2010. (in Chinese).

[2] SHEN JS. Circular economy technology support system in China [D]. Chengdu: Sichuan University, 2007. (in Chinese).

[3] COASE R. The problem of social cost[J]. Journal of Law Economics, 1960(1): 1 -44.