
Types and trend of the scale farming operation in China

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Abstract: Agriculture in China is often characterized as small-scale farming. In recent years, however, it has witnessed the widespread of increased scale (or large-scale) of farming operation. In this paper, we aim to introduce the recent development of the scale farming operations in China. Firstly, the nature of the scale farming operation and its differences compared with manufacturing sector will be discussed. Multi-type of the scale farming operations in China will then be analyzed by cases as follows, 1) the scale farming by gathering small farms (a case of grain production); 2) the scale farming by providing agricultural services (a case of agricultural cooperation); 3) the scale farming based on the stereo-agriculture (a case of innovative farming system in Zhejiang Province). Finally, the trends the scale farming operation in China will be explored.

Key Words: scale farming operation; types; China

Based on the experience of the scale farming operation in China, the paper analysis the basic characteristics and multi types and causes, and discusses the trend of the scale farming operation of China

1. The situation of the scale farming operation in China -- taking crop farming as an example

In China the land average for each farmer family is "ultra small size". Roughly, it is 0.6 hectares for China, and 1.4 hectares for Japan, 1.2 hectares for South Korea, while the United States is 195.2 hectares, Western European countries for 18 to 69 hectares (Jianming Mei, 2002). In terms of regions of China, there are larger differences (see Table 1 and Figure 1). The average cultivated area reached 40.18 Mu Heilongjiang in 2008, the same year Beijing average cultivated land area was only 0.69 Mu. According to the administrative region of China, in northwest and northeast regions the average household land scale is larger, and the average cultivated land in coastal area is quite smaller.

Table 1 average cultivated land of rural family by regions ranking China (2008)

Regions/Provinces	Average cultivated land of rural households (mu*)
Heilongjiang	40.18
Inner Mongolia	33.10
Jilin	23.11
Ningxia	21.54
Xinjiang	21.25
Gansu	18.03
Tibet	15.27
Yunnan	12.87
Hainan	12.36
Shanxi	11.99
Liaoning	11.59
Guizhou	11.01
Anhui	9.56
Shanxi	9.42
Hebei	8.94
Hubei	8.92
** National average	8.74
Tianjin	8.49
Shandong	8.22
Henan	8.10
Jiangsu	7.51
Qinghai	7.41
Jiangxi	7.05
Guangxi	6.01
Hunan	6.01
Shanghai	5.36
Fujian	4.40
Sichuan	3.99
Chongqing	3.77
Guangdong	3.30
Zhejiang	2.28
Beijing	0.69

Data source: "China Environmental Statistics Yearbook" and the statistical yearbook of relevant regions 2009.

*1 hectare=15 mu

Figure 1: the average cultivated land area of Chinese rural households by provinces in 2008 (unit: mu)



Data source: "China Environmental Statistics Yearbook" and the statistical yearbook of the region 2009

2. On characteristics and types of the scale farming operation

The scale moderation of agricultural operation based on the household of farmers should be paid more attention. The principle of comparative advantage is whether the scale of agricultural management is appropriate or not, the comparative advantage here is also the opportunity cost that farmer has in order to engage in the certain scale agriculture. As the comparative advantage is a dynamic concept, therefore, agricultural appropriate scale of operation is also dynamic, in the case of a given technology, it would be obvious that appropriate scale farming operation of will get increasing with the continuous growing income of farmers.

Various types of the scale farming operation should be also paid attention to, not only to the size of the land operation as the only standard. The necessity for the various types of the scale farming operation lies in the multi characteristics of agricultural products, which can be mainly divided into three types, the one is biased toward land-intensive products, such as grain and other bulk agricultural products, the second is biased toward capital-intensive products, the representative is the processed agricultural products and greenhouse agricultural products, and the third is biased toward labor-intensive products, mainly to vegetables, fruit, tea, and aquaculture products.

In a certain sense, the operation scale of the land-intensive products in these three types mainly depends on the matching relationship between the land and the capital, the operation scale of the capital-intensive products mainly depends on the matching relationship between the fixed cost and variable cost, and the operation scale of labor-intensive products would depend on the matching relationship between labor and capital. In addition to the bulk of agricultural products, therefore, the scale of land operation is not a decisive factor for the scale farming operation. Actually, from the perspective of multi-form of agriculture, the scale farming operation would not only be reflected in the scale of land operation, but also other forms. For example, through the establishment of professional service system in agriculture, it could form a small scale of production, but the scale of service, and again, the scale characterized with compound and stereo form could be formed through the innovation of farming system such as the combination of grain and economic crops, and the combination of planting and livestock or poultry. Furthermore, it can also be reflected through the agricultural industrial integration, and forms the scale of the vertical integration in agriculture. In short, to promote the scale farming operation, it is necessary to grasp the moderation of scale from the principle of comparative advantage, but also pay more attention to the diversity of farming scale from the characteristics of agricultural products and agricultural inherence, in order to achieve the combination of moderation and diversity of the scale farming operation.

3. Multi types of the scale farming operation in China

3.1 Scale operation of land

The scale of land operation is a form of the scale farming operations, in China, which is achieved mainly through on the transfer of the land use right or in the form of land sharing cooperative, etc.,

3.1.1 Scale operation of land based on the transfer of the land use right

According to the national survey of 230 large-scale households for grain production did by Jie Chen at the end of 2012, the whole revenue per capita for sample households is 288336.41 Yuan (about 46505 USD), among which 81.17% is from grain planting. In terms of the groups of operating scale, the relationship between the revenue and the grain planting is closely related with the expansion of the scale of planting, 99.09% of the revenue is from planting for those farmers who run more than 200 mu (see Table 2). However the relation of operating scale and yield level, thus the revenue per mu, seems not completely positive linear, but showing a trend of first increased and then reduced (see Table 3).The main reason might be that the greater the production scale, the higher the cost of supervision and management, as well the more the risk is, and this also shows to a certain extent that the scale of agricultural operations must be moderate.

Table 2: Relation between operating size and revenue from sample households in 2012 (unit: RMB)

Net revenue	Below 50 Mu	% of total revenue	50-100 Mu	% of total revenue	100-200 Mu	% of total revenue	Over 200 Mu	% of total revenue
planting	24772.50	71.89	22339.13	63.82	71773.80	97.85	626640.80	99.09
Livestock	7506.52	21.78	12502.20	35.72	1575.63	2.15	5768.25	0.91
Aquaculture	2166.66	6.29	0.00	0.00	0.00	0.00	0.00	0.00
Forestry	11.90	0.03	160.16	0.46	0.00	0.00	0.00	0.00
Total	34457.58	100.00	35001.49	100.00	73349.43	100.00	632409.05	100.00

Data from Report on Current Situations of China's Scale Grain-growing Households, Jie Chen, et al. 2014.

In addition, table 3 shows that grain yield of different varieties also having a trend of first increase and then decrease, along with the scale of the expansion, and in the household of 100-200 mu scale reaches the maximum. This indicates that, given technology, the grain yield per unit area is not necessary to get increasing with the expansion of operation scale.

Table 3: Grain yield by different varieties from sample households in 2012 (unit: kg/Mu)

	Average	Early rice	Middle-season rice	Late rice	Spring wheat	Winter wheat	Soybean
All sample	808.53	1041.39	998.48	1111.1	800	816.87	327.91
Below 50 Mu	761.3	964.94	975.31	1031.54	802.38	710.81	319.69
50-100 Mu	821.15	1057.86	1019.22	1110.71	795.12	860.66	344.02
100-200 Mu	838.31	1090.52	978.61	1203.11	809.52	839.58	296.27
Over 200 Mu	772.85	1003.21	966.23	1090.48	804.35	734.89	314.57

Data from Report on Current Situations of China's Scale Grain-growing Households, Jie Chen, et al. 2014.

Taking grain growers of Zhejiang Province as an example, their common feature is based on family labor input, supplemented by seasonal workers, but also the purchase of a small amount of agricultural machinery and having a greater demand for services. The grain is mainly sold to the state-owned grain storage enterprise, also purchased by the vendors for a small part or sold through market. The size of land which was transferred into is general 20-100 mu, mostly in 20-50 mu.

According to a survey of 57 grain growers from the research group of Modern Agricultural Research Society of Zhejiang province, in 2012, most of these farmers in the past are small farmers, through the transfer of land, and then expand the scale of cultivation, and gradually developed. Most of them are native born farmers, but also some migrated farmers; they are mainly middle-aged, have experience and interest in growing grain, and their education level slightly higher than that of the small farmers. The average scale is 41.13 mu, but the land contiguous degree is relatively low, and the infrastructure is still relatively poor. Most family revenues are at 30000 -100000 RMB, which is below the local level, and the nearest migrant workers generally.

Of course, there is also the case with large land size and while good economic benefits. For example, Dong Hongzhuan, a large grain grower at Longyou County, Zhejiang Province, has extended to 2500 mu from an area of 100 mu, and the annual farm profits has reached 0.6-0.7 million Yuan now. At beginning he contracted 100 mu in the village for planting grain in 2006, however due to mainly rely on hired labors, and he had a lot of losses at the end of year. Next year he expanded to 350 mu of grain area, but still at a loss. The main reason is high employment cost, and low labor efficiency.

In 2008, he flowed into 780 mu of land, began to try to mechanized farming. He bought a walking type transplanter and a cultivator, and the rice transplanter can work 20 mu each day, greatly improve the production efficiency. At the end of the year, excluding the cost of grain, he earned more than one hundred thousand Yuan. In 2009, he expanded grain area to 1054 mu, and to increase agricultural investment, bought two drying machine, a high-speed rice transplanter and a harvester, thus reduced the labor cost significantly, achieve grain net income of more than half million Yuan. In 2010, he continued to increase agricultural investment, realize the mechanization of grain production with seedling, transplanting, harvesting, and drying, etc. In 2012, his grain planting area reached 2100 mu, and he became the largest grain grower and agricultural machinery farmer in the county.

3.1.2 Scale operation of land based on the shares- cooperative of land

The Renfa cooperative, located in the north of Heilongjiang province of China, is a typical large scale of grain production based on the land shares-cooperatives. Initially, the cooperative, in order to attract farmers to join into, promised that a shares per mu can be guaranteed commitment of 350 yuan which was only about 260 yuan per Mu by leasing the use right of land instead of sharing the land into cooperative.

Moreover, the cooperative regard the farmers' land as investment, which can participate in the year-end earnings dividends, and the benefits of subsidy funds provided by the government are also in the average distribution of the members. In this way, the farmers can get three types of income after participating in the cooperative, in the end of 2013, farmers in the cooperative obtained 900 yuan per mu, and in the past, even they run hard, only about 300 yuan per mu a year. This greatly attracted a lot of farmers to bring the land to the cooperative, and to promote the transfer of land to cooperatives. After the land being pooling, the cooperative pushed the full mechanization of operations, and to use modern large-scale agricultural machinery for the scale operation of grain and other crops.

3.2 Scale of agricultural services

In China, due to the relatively small scale of agricultural production, a large number of young workers go out to work, so that the agricultural labor aging is serious, and the demand for agricultural service is getting increase. Agricultural service is mainly reflected in two aspects: the one is to provide professional services to the technology intensive sectors in order to ensure that land output is not reduced due to the transfer

of labor; The other is to provide mechanical services to the labor intensive sectors, in order to ensure that land output is not reduced due to the transfer of labor.

Usually, the professional service has the effect of scale, which can be achieved not only in the way of outsourcing, but also in the way of internal service based on cooperative. These professional services typically have a scale effect, both in the form of outsourcing, but also through the form of the internalization of the cooperative to achieve.

To take Shandong Province, China, for example, the province is located in the east coast of China, and downstream of the Yellow River which is the area where is less arable land for per capita, and farmers there per capita arable land is only 1.2 mu, about half of 2.34 mu per capita in the country. In this province there is more than 58% of the rural labor force to go out to work, and about 1/3 of villages the rate of migrant labor is over 70%, therefore once to the busy season, farming labor was obviously insufficient. In this context, many of counties in this province actively develop various of professional service cooperatives and to set up a complete service chain in order to provide the managed services for full or one or several links such as farming, planting, fertilizing and spraying, irrigation, harvesting, straw returning, processing, selling, etc,. Furthermore, the fees for the integrated agricultural services were charged below 10-20% of the market price, to provide farmers.

At present, they have already developed the agricultural machinery service cooperatives 353, and the professional planting cooperatives 2560. As to the organizational system of the supply and marketing cooperatives in this province, there are about 5.3 million mu to be access to managed services, and about 1.1million households benefit from this model of service.

3.3 Scale operation based on the stereo-agriculture

As to the stereo- agriculture in China, it has a history of 2000 years which originated in crop intercropping. It should be said that the scale operation based on the stereo-agriculture mainly rely on technological progress and innovation of farming system. Taking Zhejiang Province in the southeast coast of China as an example, there is quite suitable climate, multi type land, and rich crop varieties, which is quite suitable for the development of Subtropical Agriculture.

Since the ninety's in the last century, through the innovation of farming system, the various forms of farming system have been developed, such as the rotation of grain with other crops, the interplant of planting and breeding, the crop rotation of paddy field and dry land, and so on (see Table 4), which not only greatly improve the utilization of land, but also realize the scale operation featured with the stereo-agriculture on the basis of less land size which are usually about 20 mu per household.

Table 4: Main types and modes of innovative farming system in Zhejiang Province

Farming types	Farming patterns	Farming forms
Combination of planting-breeding	Paddy-Chicken rotation mode	Chicken +potato—paddy rice → chicken
		Chicken + broad bean —paddy rice →chicken
		Chicken + barley — paddy rice → chicken
		chicken—paddy rice → chicken
	Mode of combination of yearly cropping-poultry farming	Duck raising in winter fallow field—paddy rice + duck — duck
		Planting grass and raising duck—paddy rice + duck
	Cane shoot-laying duck rotation mode	Cane shoot + laying duck
	Grain-poultry-potato efficient mode	wheat—japonica rice + duck
		Potato —japonica rice + duck
	Grain-poultry-vegetable efficient mode	Mustard—paddy rice + duck — paddy rice + duck
Paddy rice + duck — paddy rice + duck		
Combination of grain and cash crop	Mushroom—paddy rice mode	Black fungus—paddy rice + duck
		Black fungus — paddy rice
	Mushroom-cash crop mode	Taro — paddy rice
		Bamboo shoots — paddy rice
	Rabbit-grain farming mode	Rabbit: ryegrass —fresh soybean —fresh corn
Combination of grain-fodder and animal husbandry	Sheep fodder-grain mode	Sheep: ryegrass/silkworm breeding and mulberry growing /ryegrass
		Sheep: ryegrass — rosinweed — paddy rice
		Sheep: ryegrass — rosinweed — ryegrass
Compound management of forest land	Bamboo shoots-chicken co-cultivation mode	bamboo & bamboo shoot + chicken
	Mode of bamboo & bamboo shoot interplanted with glabra	bamboo & bamboo shoot interplanted with glabra
Aquatic eco-breeding	Clam eco-breeding mode	Clam: silver carp, crucian and black carp
		Clam: silver carp and crucian
	River crab eco-breeding	Crab: freshwater shrimp silver carp

	mode	and soft-shelled turtle
		Crab: freshwater shrimp silver carp and mandarin fish
	Seawater pond breeding mode	Prawn: black sea bream and scallop

Data source: Zhejiang Agricultural Technical Popularizing Foundation (Shuwan Duan's master degree thesis)

Notes: In the table 4, symbol “—” stands for crop for rotation; “+” stands for co-cultivation of planting and breeding; and“/” stands for interplanting (intergrowth period is two thirds more than full growth period) .

4. Trend of the scale farming operation in China

First of all, the transfer of the land use right will promote the expansion of the size of agricultural land operation in China, however, compared with most countries in the world, it would be still smaller due to the relation of population and land in China, in other words, the situation of more population and less arable land in China will be no fundamental changed. In the short term, and relatively small scale of agricultural operation will be a long-term phenomenon for China.

Secondly, with the continuous improvement of agricultural service system, the agriculture in China will present the characteristics that size, in terms of land production, is relatively small, but would be lager in terms of service, which means that the competitiveness of Chinese agriculture, from the point of view of the scale operation, perhaps will be not the expansion of land farmer run, but the expansion of professional service scale and the improvement of service efficiency in agriculture.

The third, the scale farming operation in China, despite of various types, but from the perspective of different regions, due to differences in climate condition and resource endowment, the scale operation for land will be mainly developed in the grain producing areas of the north, the scale operation based on the stereo-agriculture will be mainly developed in the southern region, and the scale operation of professional service in the agriculture will depend on two factors, the one is the development of farmer cooperative, the other is the support of government to the agricultural service system.

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