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Research on the Grain Producers around the Year of Chinese Population Peak

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Abstract The issue of "who will grow grain in the future in China" attracts more and more attention. We estimate the structure of China's grain producers at present, and summarize the phenomena and reasons why peasants would not like to grow grain. We analyze the agricultural population at the time of China's total population peak around 2033, and we predict there will be a multi-producer structure of grain growing. The household contracts will be as the basis of grain operations then, and the quantity of small-scale households will decrease but still be huge. The degree of organization of rural households will increase and the role of cooperatives will be strengthened remarkably. We propose the "quality" requirements to ensure the grain production, and note different special groups will be the new forces on farming and grain growing.

Key words Grain production, Grain producer, The year of 2033

1 Introduction

Though China has achieved increases in total grain output for consecutive ten years, the situation of grain production is facing severe challenges. The question of "who will grow grain in the future" is raised by countless people, and cultivated land abandoning has always existed for many years as well. Food crises come and go all over the world, and the issue how to ensure food security gains more and more attention. Grain is the basic foundation of the national economy and the people's livelihood. Grain industry chain extends to many links and covers broad levels, above all, grain production is vital as the first step. Therefore, this paper analysis the grain producers at present and after 20 years, also try to answer the question of "who will grow grain in the future" in China. We found no similar research on China's future grain producers among domestic and foreign scholars, after literature reviewing.

2 Analysis on China's grain producers at present

2.1 An overview of China's grain producers at present

China's grain production environment has undergone significant changes in more than thirty years of reform and opening up. There are various forms of China's grain producers at present, with household contracts as the basis of grain operations. Rural households have operational autonomies in agricultural market activities. Small-scale rural households not only account for most of the proportion of rural residents in term of number, but also account for more than 98% in the number of grain producers, while small-scale rural households' proportion of the area of arable land and grain total yield are not such high, and per unit area yield is relatively low, as shown in table 1. The organization, scale, specialization level of China's grain production is constantly rising, and

the large-scale grain-production households, family farms and grain production cooperatives are developing quickly. Ministry of Agriculture (MOA) determines standard of large-scale grain-production households and family farms operating arable land as more than 100 mu (a unit of area, 1 mu = 0.0667 hectares) in north China or more than 50 mu in south China. The size of large-scale grain – production households' arable lands can be up to several thousands mu or even ten of thousands mu, while the operating characteristics of family farms make their lands be moderate scales. According to the statistics of MOA, the proportion of number of family farms which engage in planting is about 50%, and we deduce the proportion of number of family farms which engage in grain production will be lower, similarly, the grain production cooperatives account for the total number of farmers' cooperatives less than 10%, which indicates that the development of new type of operators in grain production is still insufficient, compare to vegetable and fruit production, animal husbandry and fishery. Moreover, the state farms cannot be ignored; with the deepening of reform of state farms management system, its function are strengthening, so as its proportion.

2.2 Phenomena of why peasants would not like to grow grain

(i) Agricultural labor force is dominated by women and the elderly, i. e. so-called "386199" army. Han Changfu, Minister of MOA, said "women account for more than half of the labor force in sectors such as agriculture, forestry, animal husbandry and fishing^[1-2]." A survey data shows that peasants aged over 60 years account for 63% of the agricultural labors^[3]. While the mid-age and the young migrate for works, and many new-generation migrants aged 20–30 go to the factories after leaving school directly, so they could not cultivate crops at all.

(ii) Peasants switch to other non-grain products business. The above survey^[3] data show that peasants aged 30–40 accounts for 3.25% proportion of 5075 agricultural labors, who mainly are migrant workers returning home to start businesses or are engaging in specialized cultivation such as vegetables, flowers, traditional

Chinese medicinal herbs, breeding, etc.

(iii) There are lots of industry management currently. Peasants have much free time apart from agricultural work, and Li Xunlei^[4] (2012) estimates that there are 29% (80 million persons) of rural labors in rural primary industry have part-time non-agricultural work, according to the "2011 China Statistical Yearbook".

(iv) There exists abandoned arable land. this is the most worrying phenomena, which increased largely in 20 century middle

Table 1 Estimation of grain producers in China at present

Items	Small-scale households	Large-scale households	Grain cooperatives	Family farms	State farms	Sum
Number//10 ⁴	120 – 150 million	68.2	5.59	30	0.178	–
Average land//mu	8.36	196.5	1291.2	200	–	–
Per unit yield//kg/mu	350	486	545	486	476	–
Percentage of total arable land	55.1%	7.3%	4.0%	3.3%	4.2%	73.9%
Percentage of total grain yield	66.5%	12.7%	8.2%	5.7%	5.6%	98.7%

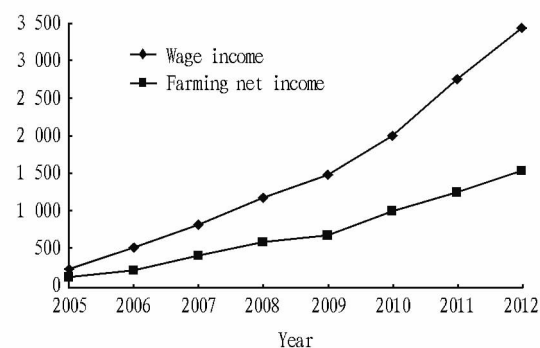
Data sources and notes: (i) The data of large-scale households and grain cooperatives come from 2013 national survey by Department of Crop Production of MOA; (ii) Data of state farms are from the website of Bureau of State Farms and Land Reclamation of MOA and China Statistical Yearbook; (iii) There are no published data of Small-scale households and family farms, data in the table are calculated according to 2010 China agricultural development report issued by MOA, national survey of all family farms conducted by MOA, statistical yearbooks; (4) due to the limitations of the basic data and conversion, it is not excluding double counting.

2.3 Reasons why peasants would not like to grow grain

(i) The ordinary peasant household's arable land scale is small, and the profit of growing grain is low. Table 2 shows, the average annual net profit of the three main grain crops (rice, wheat and corn) is 467 yuan per mu in 2009 – 2012, and the ordinary peasant household generally operates about 7.12 mu^[6], so the total annual net income is about 3233 yuan, but the peasant per capita expenditure is about 4876 yuan. If the household's land scale expands to 200 mu, there will be a total net income of 93344 yuan (there are average 4 persons per household), which is higher than the per capita annual disposable income 20665 yuan of urban residents, so it is attractive. (ii) Growing grain has low comparative effectiveness in agriculture. The overwhelming majority of peasant households could not expand the land scale, but under the condition of same land size, specialized agriculture such as growing vegetable and fruit has higher yields and profitability. The income of grain is much lower than that of planting economic crops^[7]. (iii) The opportunity costs of growing grain are huge. The rapid development of industrialization and market economy, together with the wage increase in enterprises recent years, may render 1 – 2 months wage exceed the whole year net profits of growing grain. Fig. 1 shows wage income has exceeded farming net income in per capita annual net income of rural households since 2005, and the gap has been increasing. Even in rural area, one always pays temporary employees the equivalent money of migrate workers' wage. The rapid rise of opportunity cost of agricultural labor input results in farmers have to choose so-called "forced leisure"^[8]. (iv) The investment and costs of growing grain are high. The prices of seeds, agricultural machinery, diesel oil, chemical fertilizer, pesticides and other agricultural materials are increasing significantly, for example, a large-scale household in Hunan's biggest grain producing county i.e. Ningxiang, contracts more than 1000 mu, and

and late 90's, and the phenomena of obvious abandon have been still concerned since 2008, for example, Yuan Longping's national CPPCC proposal in 2012 showed: he found many arable lands were abandoned when visiting rural areas from 2010^[5]. This occurs in the conditions of the abolition of agricultural tax, the increase of subsidies and other favorable policies, i.e. government supporting agriculture policies still cannot prevent the tendency of peasants leaving arable land.

the annual circulating fund should not be less than 600 000 yuan, but bank loans cannot meet the money demand, as a result, the interest paid for usurious loan reaches as high as 140 000 yuan^[9]. (v) Growing grain is a hard work. It is not only dirty and mess, but also the pesticides, dust and others affect the health, which is also important reason why many young people do not want to farm. (vi) Peasant is considered as a kind of status in China, whose income is not high, social status is low, and social security is insufficient. They hope rural young generation makes every attempt to jump out of the "farm gate".



Source: 2006 – 2013 China Statistical Yearbook.

Fig.1 Comparison between wage income and farming net income in per capita annual net income of rural households since 2005

3 Analysis on China's grain producers in the future

3.1 The huge agricultural population is still the biggest prerequisite for this matter The huge population with relatively little arable land is the first issue to be considered, and is the fundamental limitation. The State Population and Family Planning Commission of China predicted that China's total population peak will be about 1.5 billion around 2033^[10]. The urbanization rate is

expected to be 65% or so then, and there will be about 525 million rural residents. There was about 260 million employment population in primary industry in 2012, whose proportion declined to 34% from 58% over the past 20 years. The current proportion of total employment accounted for about 56% in population, and this proportion may be reduced slightly, taking into account the aging and extension of the retirement age, so the total employment popu-

lation will be about 750 – 800 million around 2033. We assume primary industry employment proportion may reduce to 20 – 25% then, therefore, the employment population in primary industry is estimated as 150 – 200 million in 2033, and this figure renders rural areas do not have the conditions of widespread large scale land.

Table 2 The average annual net profit of three major grain crops

× 10⁴ yuan/mu

Grain	2009			2010			2011			2012		
	Rice	Wheat	Corn	Rice	Wheat	Corn	Rice	Wheat	Corn	Rice	Wheat	Corn
Net profit	251.20①	150.51②	175.37③	309.82	132.17	239.69	371.27	117.92	263.09	285.73	21.29	197.68
Average	414.14 ④			495.75			561.78			395.22		
Annual average	466.72											

Source: 2011 – 2013 China Rural Statistical Yearbook. Note: it is assumed that rice is planted twice a year, while wheat and corn are planted in rotation a year, therefore, ④ = $[\textcircled{1} \times 2 + (\textcircled{2} + \textcircled{3})] / 2$ for 2009, and it is the same treatment for 2010, 2011 and 2012.

3.2 Analysis of the change and the proportion structure of the main grain producers

Considering the productivity level is yet not highly developed around 2033, the relations of production will remain household contracts as the basis of grain operations, which is greatly different from the current separate households operating. The degree of organization needs to be improved by a big margin, through the function of cooperatives that provide a full range of services. Households' average operating land scale will be larger than that at present, due to the reduction of agricultural population. Through land circulation and other forms of equity conversion, a portion of rural households will expand to be the large-scale households and family farms, while many other households will have a higher proportion of part-time non-agricultural work to maintain a certain income. Grain cooperatives, large-scale households and family farms will obtain great development, as well

as there will have other form organizations, such as state farms, "company + peasant households", and rural land shareholding co-operative system, and agribusinesses, and new forms will emerge in the farming practices. All these constitute a multi-producer structure, which tend to be stable in constant adjustment.

We estimate the structure shown in Table 3, according to the trend extrapolation. The quantity of small-scale households will decrease but still be huge, while that its percentages of arable land and grain yield reduce significantly is because of the increase in the degree of organization. The majority of small-scale households will take part in the grain cooperatives, and the role of cooperatives will be strengthened remarkably. Of course, the relations among the large-scale households, family farms and grain cooperatives and other forms will be close as well.

Table 3 Estimation of grain producers in China around 2033

Items	Small-scale households	Large-scale households	Grain cooperatives	Family farms	State farms	Others	Sum
Number (10 ⁴)	100 – 130 million	250 – 300	30 – 40	150 – 200	0.17	–	–
Percentage of total arable land	15%	15%	26%	8%	4%	2%	70%
Percentage of total grain yield	16%	23%	40%	12%	6%	3%	100%

3.3 The "quality" requirements to ensure the grain production

Besides the issue of "who will grow grain in the future", it should also be more considered that the "quality" requirements of grain production, namely, how to grow grain, under what kind of conditions and circumstances. We believe that the key of "quality" requirements is not to reduce the total number of small-scale peasants, but rather to focus on advancing the degree of organization, and enhancing benefits of system reform through improving the relations of production.

In the next years, governments will deepen the agricultural and rural comprehensive reform. According to "integrating rural and urban development is the fundamental solution to issues relating to agriculture, rural areas and farmers" proposed in the report of 18th CPC National Congress, China should go beyond the grain production itself and agricultural scope, and grain production

must be considered from the overall perspective of agricultural modernization and national economy system.

China should deal with the contradictory relationship properly between the tendency of not to grow grain and the overall need of food security. That rural households do not grow grain is a reasonable market behavior, from a micro-rational point of view of their own earnings; it will impact the food security, if these phenomena are widespread, therefore, it should be strengthened to support and protect grain producers, and not let them suffer.

China should focus on the whole grain industrial chain, not only the growing segment. We should secure supply capacity of production, through the benign interactive among links of industrial chain. We should support grain cooperatives to extend to the segments of grain circulation and processing from growing segment. We should combine grain growing with other crops growing

and livestock breeding, as well as combine coarse cereals with three main grain crops (rice, wheat, corn). Rice is different from wheat and corn, since rice can be operated as brand and geographic identifies to add value. Some coarse cereals can easily be carried out brand marketing due to respective unique features.

Governments of all levels should make efforts to support the development of cooperatives, and improve the degree of organization and the level of socialization services, and provide good public service and business environment, and promote infrastructure construction, the application of science and technology and the agricultural and rural informatization work. Governments should organize long-term education and training for farmers, and must train a lot of new type of professional farmers, to improve their skills and culture quality. Governments should vigorously develop service industry for agriculture in the rural areas and small towns, to increase employment and agricultural surplus labor force transfer.

Governments should raise the level of farmers' old-age pension, medical care, and other social security, and expand the scope of social security, and provide equal public services between urban and rural areas, and weaken the security function of arable land, and relieve farmers' worries of without land to engage in non-agricultural employment, and raise farmers' social status.

3.4 The choices of different special groups The so-called migrant workers have close relationship with the issue of "who will grow grain in the future". We predict that the appellation term "migrant worker" will no longer exist around 2033. Their possible choices may be as fallows: (i) The majority of older migrant workers (over 40 years old) will return to the rural areas and do farm work, for they have farming experiences and other factors such as family members are in rural areas. (ii) New generation migrant workers under 30 years old generally have no farming experiences, so most of them would not like to do farm work, on the other hand, they have adapted to the city life, therefore, they will gradually become urban residents, and their land can be transferred it to other farmers. (iii) The migrant workers aged 30–40 years old are faced with two alternatives: to stay in the cities, or to return rural areas, however, the former is more possible one.

Some people will adhere to long-term grain operation, and play a leading role, due to social responsibility and feelings to agriculture, or they think highly of economies of scale. Other people who have received higher education choose to start a business in rural areas and become "new generation farmers", because of the responsibility and interest or lifestyle choices. Some NGOs and

foundations could organize university graduates to participate rural cooperative organizations construction, and they generally engage in specialized agriculture and ecological agriculture. Although they do not necessarily grow grain, they will have a very good promotion and demonstration effect, moreover, they are also the important carriers of application and innovation of agricultural science and technology, to promote agricultural transformation from traditional pattern to modern agriculture.

4 Conclusion

Growing grain is the first step and the beginning of food security and China's grain growing situation remains complex. China should raise earnings of grain growing by innovation and improving business models, and make grain producers also enjoy the fruits of economic development and social progress. Only in this way can we not worry about the issue of "who will grow grain in the future".

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