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Impact of Industrialization on Grain Consumption and Countermeasures

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Abstract This paper analyzes the impact of industrialization on grain consumption from growth of residents' income and change of diet structure, expansion of size of population, and development of new biomass energy industry. The economic growth in the course of industrialization promotes growth of residents' income, changes residents' diet structure; industrialization leads to rural urbanization and rise of urban residents; industrial development brings about grain demand of biomass energy. All of these greatly increase demand of grain consumption. On the basis of these situations, it presents following countermeasures to guarantee grain consumption demand in the course of industrialization: heighten awareness to fully realize the significance of rapid development of industrialization to grain security; control population growth and improve grain conversion ratio; strengthen grain-saving construction and advocate moderate consumption; develop non-grain biomass energy in many channels to guarantee grain security.

Key words Industrialization development, Demand of grain consumption, Grain security, Countermeasures

Grain consumption refers to the combination of production consumption of grain (industrial grain, feed grain and seed grain) and living consumption (food) of the whole society in certain period. The grain consumption includes direct consumption and indirect consumption. The direct consumption is food directly consumed by urban and rural residents. Direct consumption of grain determines stable grain supply and demand and grain security. The indirect consumption of grain mainly includes feed grain, industrial grain and seed grain. The experience of socio-economic development both at home and abroad indicates that the industrialization development drives urbanization development, leads to circulation of population, labor and other resources between urban and rural areas, promotes expansion of food industry, and improves income level of urban and rural residents and diet structure. All these will result in great change of grain consumption and greatly increase demand of grain consumption. The satisfaction degree of grain consumption demand determines the degree of grain security. Therefore, we should carry out comprehensive analysis of China's grain consumption situation in the course of industrialization, and grasp characteristics and development trend of grain consumption. This is an effective approach to ensuring balance between grain supply and demand and grain security, and also a basic condition for prompting smooth advance and rapid development of industrialization.

1 Impact of industrialization on grain consumption

The impact of industrialization on grain consumption not only includes impact on living consumption and production consumption, but also includes impact on direct grain consumption

and indirect grain consumption. I analyze the impact of industrialization on grain consumption from growth of residents' income and change of diet structure, expansion of size of population, and development of new biomass energy industry.

1.1 Impact of growth of urban and rural residents' income on grain consumption in the course of industrialization

Increase of population and growth of income are major forces promoting growth of grain demand. Increase of population directly acts on growth of grain consumption demand, while the growth of income is mainly manifested by diet structure, from which the indirect grain consumption is derived. At present, China has stepped into the middle period of industrialization and rapid development of urbanization. At this stage, according to international experience, the growth of indirect grain demand will exceed the expansion of direct grain demand. This is because the development of industrialization and growth of residents' income will certainly bring about growth of grain consumption demand and improvement of consumption level. Specifically, the income growth will surely change grain consumption structure of urban and rural residents. In other words, it will reduce direct grain consumption and increase indirect grain consumption.

Statistics show that, in 1995 to 2008, there was a great change of income level and grain consumption structure. Compared with 1995, the disposable income per capita of urban residents in 2008 increased to 15 780.8 yuan from 4 283 yuan with an increase of 268% approximately; the net income per capita of rural residents increased to 4 760.6 yuan from 1 577.7 yuan with an increase of about 202%. In the food consumption structure of urban and rural residents, compared with 1995, the annual direct per capita grain consumption of urban residents reduces by 20.2 kg, while the annual indirect per capita grain consumption of urban residents increases by 9.05 kg. In the same period, the annual direct per capita grain con-

sumption of rural residents reduces by 57.03 kg, while the annual indirect per capita grain consumption of rural residents increases by 7.43 kg^[1].

At the same time of annual direct per capita grain consumption of urban and rural residents reducing, the annual indirect per capita grain consumption increases, mainly because of increase of meat, egg and dairy products resulted from improvement of diet structure. In 1996 to 2004, meat product consumption of urban and rural residents increased to 58.7 million tons from 28.25 million tons with annual increase of 4.7%, and the per capita consumption increased to 45 kg to 23 kg with annual increase of 4.3%; egg product consumption increased to 13.45 million tons from 4.565 million tons with annual increase of 7%, and the per capita consumption increased to 10.35 kg from 3.73 kg with annual increase of 6.6%; dairy product consumption increased to 32.887 million tons from 7.343 million tons with annual increase of 9.8%, and the per capita consumption increased to 25.3 kg from 6 kg with annual increase of 9.4%. The optimization of food consumption structure makes total per capita grain consumption increase to 377 kg from 337 kg^[1].

The increase of demand for animal-derived food reduces the direct per capita grain consumption to some degree, but this not necessarily reduces per capita grain demand. On the contrary, it will lead to substantial increase of per capita grain consumption. This is because the conversion of grain into animal-derived food is not the simple 1:1 relationship, but rather has a specific conversion ratio. For example, according to raising habit in China, the conversion ratio of pork, beef and mutton, poultry, and eggs into grain is 1:4.0, 1:2.0, 1:2.0 and 1:2.5 respectively. Pork output contains much water in the course of statistics, so it is calculated at proportion of 80%. According to relevant researches, the feed grain takes up about 70% in feed^[2]. Therefore, the feed calculated at the above proportion multiplies by 70%, we can get the actual feed grain.

In 1995 to 2008, the annual per capita feed grain consumption of urban residents presents a rising trend (from 64.6 kg to 79.4 kg); the total feed grain consumption of urban residents also takes on a rising trend (from 3 733 tons to 7 812 tons), and the peak amplitude of increase appears in 2001 to 2002. With rapid advance of new industrialization, urban and rural residents' income continues growing, and diet structure is further improved, indicating that there is still a great space for growth of indirect grain consumption, which will exert tremendous pressure on future grain supply.

1.2 Impact of increase of urban and rural residents on grain consumption

By the end of 2005, the population of China had reached 1.307 billion, including 562 million urban people and 745 million rural people, with urbanization rate up to 43%. According to existing estimation, if the urbanization rate reaches 60% in 2020 and the population reaches 1.5 billion, the urban population will reach 900 million; if the urbanization rate reaches 70% in 2030, the population will reach 1.6 billion and urban population will be 1.12 billion. If calculated at annual per capita grain consumption (483 kg) of Beijing, Shanghai

and Tianjin in 1995, the urban people will consume 540 million tons of grain in 2030, which will pose a huge test for China's grain security.

The rule of urbanization development in the world indicates that when the urbanization rate in a country or region reaches 30%, the urbanization will enter into rapid development stage, the annual urbanization rate will increase 1.58 to 1.66%, which is an irreversible objective law^[1]. By now, the urbanization rate of China has reached 50%, therefore, in a relatively long time, high economic growth will continue along with constant advance of the urbanization. In addition, the rapid advance of urbanization will change the distribution of urban and rural population, and numerous rural people will flow to cities and become urban population. This will lead to great reduction of grain producers and sharp rise of commodity grain demand. By the end of 2007, there had been 210 million migrant workers in China. Most of these 210 million people are turned into pure consumers from agricultural product producers. Self-sufficient agricultural products changing to "commodity" products greatly increases commodity of agricultural product consumption. Take the case of pork consumption, only calculate annual per capita consumption of households, cities consume 4.5 kg more than countryside. Transfer of 200 million people increases 0.9 million pork consumption. Since pork is converted from feed grain, it indirectly increases grain consumption.

In future development of China, the urban population will continue growing, total indirect grain consumption of urban residents shows a rising trend, then it poses greater pressure for China's grain supply.

1.3 Industrial grain as new growth point of grain consumption

Industrial grain is another channel of grain consumption. Compared with grain for living consumption (food) and feed grain, industrial grain has distinct feature, and part of industrial grain (for example, meat products, dairy products, fish products and poultry products, etc.) converts grain into food for people.

At present, there are over 2 000 types of grain processing products. Application of industrial grain is wider and wider, and growth rate of consumption is faster and faster. Especially since the 1990s, the growth rate of industrial grain has been very obvious. In 1998, the industrial grain consumption was 39.19 million tons, in 2002, it reached 44.87 million ton, with growth rate exceeding 3.4%. In 2005/2006 and 2006/2007, the industrial grain consumption of wheat, corn and rice was 30.74 million tons and 37.18 million tons (exceeding over 21%); in 2007/2008, it reached 42.21 million tons, growing about 13.5%^[4].

What's worse, non-processing food products, such as biomass energy grain, compete for grain with people. In 2006, fuel ethanol produced by grain in China reached 1 million. Calculated at 1:3.3, it consumes about 4.75 million tons of corn, accounting for 3.3% of domestic corn output of that year. It is shown that the consumption of corn in ethanol production takes up a lower proportion in corn output. So some experts the development of ethanol production from corn has little influence on

corn or grain market. However, because projects of fuel ethanol production with grain as raw material are put into production in recent years, the grain demand accordingly is newly increased demand. Such demand accounts for 1/3 of the annual average fluctuation of corn output and leads to rise of domestic corn price and even grain price. We should pay special attention to this problem.

2 Countermeasures and suggestions to guarantee grain consumption demand in the course of industrialization

To reach balance of production and sales of grain in China and satisfy demand of grain consumption, we should take following effective policies and measures.

2.1 Fully realizing the significance of rapid development of industrialization to grain security In the actual condition of rapid advance of industrialization, we should pay more attention to status and functions of grain production and take grain production as primary task of modern agricultural construction. The government should further recognize the fundamental and strategic position of agriculture and the importance of grain as fundamental public goods. Foreign experience also indicates that the fundamental position of agriculture should be unswerving and we should not ignore the grain security in the period of speeding up industrialization and urbanization. Although the proportion of added value of agriculture into GDP may decrease further, the fundamental position of agriculture will not change. For example, in the United States, Japan and European Union countries, the proportion of agriculture is already very low, but they still pay attention to supporting and protecting agriculture and grain, and provide high amount of subsidy for agriculture and grain. Therefore, China also should solidify fundamental position of agriculture and guarantee grain security. Otherwise, the industrialization and urbanization may encounter fluctuations or even be interrupted. At the time of making decisions on grain production, it is required to reach common understanding with high level of uniformity, and practically guarantee grain security.

2.2 Controlling population growth and improve grain conversion ratio Statistics show that the birthrate of population in China has reduced to present 1.1% from 2.7% in the 1970s. In addition to rise of grain yield, the conflict between grain supply and demand is alleviated. With this population growth rate maintained, China's population would not exceed 1.6 billion by 2030. However, there will be still a net increase of 10 million people annually, while the cultivated land decreases at the speed of 200 000 hm²/year. Thus, the human-land conflict will become more prominent and the pressure of grain security will be greater and greater. In this situation, it is required to continue implementing family planning policy to control population growth, especially in rural areas and some minority areas. Actual situations indicate that only through effectively controlling population growth and keeping its growth rate lower than growth rate of grain, can grain security be guaranteed in the course of industrialization in China.

2.3 Strengthening grain-saving construction and advocating moderate consumption In the context of new industrialization, the grain supply is slightly tight and grain security is weak, therefore we should not only broaden resources, but also value reduction of consumption to guarantee grain security of China. Based on improving grain production and anti-disaster abilities, we can reduce losses in harvesting, transportation and storage, improve grain conversion ratio and use non-grain resources to take the place of industrial grain.

Besides, it is required to advocate moderate consumption of grain, and let every one know national conditions of grain production. Since there are great losses and wastes in grain and food production, storage, processing, transportation and consumption, relevant government departments should make definite their respective tasks and responsibilities, cooperate with other departments to have better performance in grain production, storage, processing, transportation and consumption, as well as grain-saving works in administrative organs, enterprises and schools. In addition, it is required to make detailed implementation scheme on the basis of actual conditions, and regularly organize special examination of grain-saving, to ensure implementation of various grain-saving measures.

2.4 Developing non-grain biomass energy in many channels to grain security To realize "not competing for land with human" and "not competing for grain with human", China advocates and supports the development of non-grain biomass energy. The non-grain approach adopted by biomass energy can guarantee China's cultivated land security and grain security. Therefore, it is required to take proper measures to accelerate the development of non-grain biomass energy industry.

This is to develop new biomass energy in regions where it is not suitable for planting main grain crops. Specifically, we can take following measures to develop biomass energy. In the first place, China has rich forest and sand resources, we can use their marginal areas to build biomass energy base. In the second place, we can adopt abundant mountainous areas, mud flats and saline and alkaline land to plant non-grain crops, such as Chinese sorghum and cassava, to provide sufficient raw material for biomass energy. In the third place, we can use waste of agriculture and forestry as raw material of biomass energy. In the fourth place, livestock and poultry manure, dead branches and rotten leaves, industrial organic waste, kitchen rubbish, and swill can be turned into biomass energy. This not only ensures development of new biomass energy industry and increases energy supply, but also guarantees grain security.

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