

The Developing Strategy Prospect of Horticultural Industry in China

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Horticultural crops include fruit, vegetables, flowers and tea. The performance of the horticultural industry level reflects the degree of human social progress and civilization directly. The developmental experience of the world horticultural industry shows: I) the horticultural industry, as a technology-intensive industry, needs the support of science and technology and is the key area of agricultural high-tech. II) the horticultural industry, as a labor-intensive industry is suitable for countries with a large population and relatively little arable land, especially countries with traditions of intensive agricultural cultivation. III) the horticultural industry, as an industry combined closely with culture, the artistry through the whole system which includes teaching, research, promotion, production, trade, etc.

The size of the China horticultural industry scale has placed it first in the world since 2000. In 2010, the planting area of horticultural crops was 35.7 million ha; total production quantity was more than 880 million tons and the gross output value was more than 1.9 trillion Yuan, accounting for 51.81% of the planting industry output. The number of Horticultural industry workers was about 114 million accounting for 41.33% of the planting industry workers. Understanding of the economic and social situation of horticultural industry facing is important for making the developing strategy prospect of China horticultural industry.

1.1 Horticultural products demand is increasing

1.2 Vegetable demand increasing steadily with growth of population.

As a populous country, China's population is 1.335 billion accounting for 21% of world population, 1/3 of Asia's population and more than the total population of all developed countries. At present, natural population growth has slowed gradually, but because of a large population base, the growth is still apparent. The vegetable crop is a major agricultural crop, following the grain. The demand for quantity and quality of Horticultural products is rising with the improvement of people's living standards. Horticultural production has been transformed from extensive farming to intensive industry with the accelerated urbanization that is one important characteristic of social development. The Chinese urban population has grown from 19.4% of the total population in 1980 to 50.4% in 2011. It is estimated that the

urban population will be 56% of the total by 2020. Urbanization has a very important function in promoting the consumption of horticultural products, especially functional horticultural products.

1.2 Accelerating urbanization and increasing production intensity

In recent years, the transfer of rural surplus labor to cities has led to a reduction of labor force engaged in planting industries and also led to land concentration. As a result, the intensification and specialization of production in the agricultural planting industry has improved gradually, exemplified by formation and ceaseless expansion of activities such as large-scale, intensive, centralized seedling production of special purpose varieties and cool season vegetable production in high altitude areas during the hot months of summer. The increasing degree of agricultural intensification provides opportunities and challenges for the development of the horticultural industry.

2. Citizen's consumption diversity and increasing demand for functional horticultural products

2.1 Diversification of citizen's consumption of horticultural products

People pay more attention to nutrition and health protection. Demand has already diversified, the people want diverse products. Diversification of the supply of horticultural products is urgent, driven by the progress of society and improvement of human living standards. Currently, consumption of white foods (mainly white flour, sugar, rice and other starchy, high-calorie foods) is decreasing, while consumption of green foods (safe food, leafy green vegetables), red foods (referring to red, orange red or brownish red foods, such as colored pepper, tomato, carrot, sweet potato, hawthorn, apple, strawberry, jujube, pumpkin, red rice, persimmon, etc.), black foods (black fungus, seaweed, hair-like seaweed, dateplum persimmon, chestnut, black sea cucumber, etc.) and yellow foods (referring to yellow fruits and vegetables, such as carrot, soybean, peanut, apricot, etc.) is increasing. Enough starchy carbohydrates meet people's energy needs, while people also hope to consume a colorful variety of horticultural products. This provides an excellent development opportunity for the horticultural industry.

2.2 The increasing demand for functional horticultural products

Nowadays, the research on horticultural plants not only focuses on their edibility but also the function of medical care. Horticultural products contain abundant vitamins, celluloses, volatiles, aromatic substances and others functional substances.

The role of these components in human health is receiving increased scientific attention more attention. Every horticultural product may represent one or more traditional Chinese medicine that will play a role in improving consumer's health.

Red food not only has good influence on treating iron deficiency anemia and relieving fatigue, but also has preventive and therapeutic effects for breast cancer.

Natural black food contains minimal objectionable constituents and can reduce the risk of some serious illness, such as arteriosclerosis, coronary heart disease and cerebral apoplexy, etc. From modern medicine, black food contains the three major nutrients, vitamins, microelements and has some special functions such as improving kidney function, retarding senility, prevention and treatment of diseases, nourish hair and as cosmetic effect,

Yellow food is rich in vitamins A and D, which are important for human health. Vitamin A can protect gastric and intestinal mucosa and prevents gastritis and gastric ulcers from occurring. Vitamin D can promote absorption of calcium and phosphate, so it has the function of strengthening muscle and bone and preventing rickets in children, and preventing juvenile myopia and senile osteoporosis. Because of the medical functions of horticultural products, the demand will significantly increase in the future. This provides a good opportunity for the development of horticulture industry.

3. Pay more attention about increasing utilization of agricultural resources

3.1 Obvious contradiction of competing filed between planting industries.

The gradual reduction of land resources has been most problematic for planting industries in China. According to statistics, the national cultivated area was 130 million ha in 1995, but had fallen to 121.7 million ha in 2008. Experts agree that 120 million ha is the critical level to provide sufficient production for domestic consumption .The per-capita cultivated area was 0.25 ha, 0.1 ha and 0.092 ha in 1949, 2003 and 2008, respectively. Population growth and simultaneous decrease in the area of cultivated land has been the most prominent contradiction during the process of modernization. The speed of urbanization is being accelerated. Industrial and urban land is increasing at the expense of cultivated land aggravating the tight situation of arable land. According to statistics, the area of cultivated land has fallen 287,000 ha per-year since reform and opening up. Additionally, some cultivated land has been destroyed by disease, used for ecological restoration, or has been unlawfully

appropriated. So the test of preventing the decline of cultivated land is still very arduous.

In contrast to decline of cultivated land, horticultural planting area has steadily increased. Figures 1 and 2 show the trends of planting area and production quantity of the main horticultural crops (vegetable and fruit). In 1996, the vegetables area was about 10.56 million ha and total production was about 30 million tons. In 2006, the vegetable area and total production had almost doubled to about 19.63 million ha and 57 million tons, respectively. The area of fruit has increased 6-fold over the past fifty years, and notably over the past twenty years, has increased 3-fold (Fig. 2). Currently, because of policy implementation for protection of grain crop farmland protection, continued increase of horticultural crop land area will be difficult. Vegetable production will focus on improving yield and raising the multiple crops indexes through rotation, Vegetable production will focus on improving yield and raising the multiple crop indexes through rotation, intercropping of horticulture crops as well as filed crops in the future.

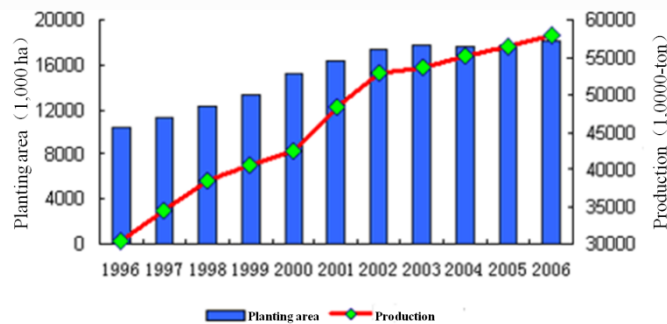


Figure 1 The trend of vegetable planting area and productions in China

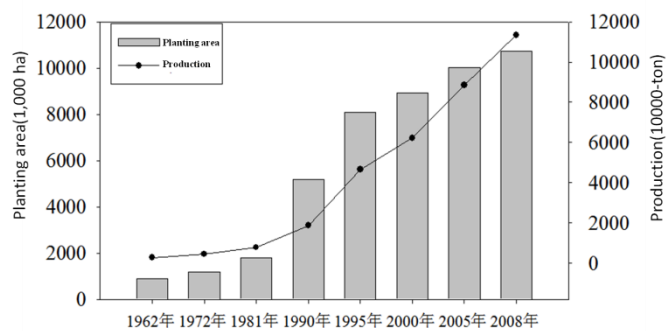


Figure 2 The trend of fruit planting area and productions in China

3.2 Water resource shortage and low efficiency utilization

Water resource shortage is a worldwide problem. Drought and semiarid areas account for 52.5% of the land area of China. As one water-short country, Chinese water resource per capita is only 1/4 of the world average.

According to Ministry of Water Resources statistics, the annual mean quantity of

water resources was 2.8124 trillion m³, which declined to 2.6721 trillion m³ from 2000 to 2008. If this rate of decrease continues water resources will decline to 1.8 trillion m³ in 2030. At the same time, water resources are disproportionately distributed. The region of the south Yangzi River makes up 36.5% of homeland, and its water resource accounts for 81% of total quantity. The region of the north Yangzi River make up 63.5% of homeland, and water resource is only 19% of the total. The rainfall of north regions is less than south regions. In addition, the reasons for water shortages are diverse among regions. Water shortage in north regions, south regions and midwest regions are related to rainfall shortage, water quality-induced water shortage and engineering water shortage, respectively.

Agriculture consumes the most water resources in China. Agricultural water consumption each year was 0.956 trillion m³, 4.434 trillion m³, 3.8 trillion m³ in 1940, 1990 and 2008, respectively. Water consumption was 8,745 m³/ha in 1980 and decreased from then on, and was 6720 m³/ha in 2005. Water consumption is different for different horticultural crops. Water consumption of vegetables is more than for fruit trees and grain crops.

3.3 Improved availability of heat and light

Light and heat are the most important resources for living plants and consequently have major impact on agricultural production. Light use efficiency by plants is less than 1.5% and is the key factor that limits agricultural production. The development of solar greenhouses and other horticultural facilities, allowed recognition of the benefits of producing horticultural crops in late autumn, winter and early spring; light use efficiency was raised obviously. At present, horticultural facilities are simple and crude and light-use efficiency is not ideal. So there are still all kinds of opportunities and challenges for facility horticulture.

3.4 Excessive inputs and their efficiency of use

The increases in yield and total production of horticultural products have relied on increasing use of expensive inputs that may be detrimental to human health and the environment.

In 2008, 1.672 million tons of pesticide and 52.39 million tons of chemical fertilizer were used, accounting for 33.3% and 33.5% of the world's utilization, respectively. Agricultural water consumption was 366.4 billion m³ and made up 62% of globe consumption. But the efficiently irrigated area only was 58.5 million ha and made up 20% of the global irrigated area.

It is important to note that the consumption of chemical fertilizer and water of vegetables is more than fruit and grain crops. Although the yield and benefit of vegetables have been enhanced obviously, there remain a lot of problems for sustainable development of the horticultural industry, such as continuous cropping obstacles, ground water pollution, and product safety and so on.

4. Soil degradation and frequent disasters

4.1 Serious soil degradation and the product safety problem

Because of unreasonable application of chemical fertilizer, abuse of pesticides, over use of plastic film, using manures, wastewater and sewage irrigation, about 20% of total farmland has been polluted seriously. Application amounts of nitrogen and phosphorus in China was 2.05-fold and 1.86-fold of world average. Application amounts of pesticides are high and have grown more than 1.2-fold since 1991. However, most chemical fertilizers are not used by the plant, and the presence of excess fertilizer can lead to serious pollution. The area of farmland using plastic film was about 30 million ha and made up 62% of world usage. The residue of plastic film was about 300,000 tons and more than 40% impurity of plastic film was stayed in soil. Manure abuse became a new source of pollution following the development of animal breeding industry. Quantity of wastewater effluent was 57.2 billion tons and a large amount of this wastewater was directly used for irrigation. The above problems have led to problems of soil and environment pollution that have been difficult to solve.

4.2 Meteorological disasters and damage by disease, pest, weed and rodents

China has vast land area and complex climate and is vulnerable to various natural disasters. There are water logging, flood and hail in summer. Drought, windburn and sand damage often occur in spring. Chilling damage can occur in early spring and late autumn and freezing injury in winter sometimes occur. High and stable yields of horticultural products are threatened by these disasters.

In addition to threats of meteorological disasters, yield and product safety are also threatened by damage due to diseases, pests, weeds and rodents. Especially, because of the controlled atmosphere in facilities, a lot of pests not only live through the winter, and but also increase generations. On the one hand, the damage of horticultural crops is more serious; on the other hand, the production of crops in open-field is at risk.

5. Construction and enhancement of circulation and information platform of agricultural product.

Horticultural products are fresh and their marketing requires exchanging information quickly and time-efficient logistics. At present, the information platform could be considerably improved, and processes of product acquisition, transport, and delivery have lot of problems. Also low branding rates, serious post-harvest losses, weak resistance to natural disasters and high market risk area all areas that need improvement.

The contradiction between individual small agricultural production and big market and circulation is particularly prominent. Because of land decentralization, low level of systematization and minimal control of planting area by government macro-control measures, the price of horticultural products fluctuate widely. There is often a wide gulf between the prices received by farmers and that paid by the consumer. So vegetable growers could not get high benefits. Consumers could not obtain ideal products.

China is the main producer of fruits, vegetables, flowers and tea, but raw materials and semi-finished products are the main export commodities. Branded products and high value-added or intensively processed products are largely absent in the export market. In international competition, the advantage of the Chinese horticultural industry is mainly cheap labor. Now, labor costs are rising rapidly in China, so the advantage will be weakened gradually.

6. The role of breeding for horticulture development

Breeding is probably nearly as old as agriculture itself, carried out by sharp-eyed farmers who saw differences among the plants they were growing and chose the best plants in order to make the next crop better than the last. Progress has been continual. Early vegetable breeders developed landrace cultivars by selection of favorable variations in horticultural traits, yield, and resistance to diseases and other problems. New methods were developed, including hybridization techniques, culminating with the use of recently developed molecular tools, all leading to our modern sophisticated cultivars. In recent times, there have been challenges and new trends in the breeding domain, some laudable, others discouraging and distressing. These include: i) an unrelenting movement away from well supported public breeding institutions to a breeding world dominated by private entities; ii) an increase in size of the companies in the private sector, with emphasis on the major vegetable crops; and iii) greater emphasis on protection of cultivars by seed companies, including plant cultivar protection, patenting, and development of F₁ hybrids.

Public sector breeding, particularly regarding vegetables, must be strengthened through increased taxpayer support and perhaps partnerships with private industry. Smaller seed companies, which are usually specialized in few vegetable crops, must be supported, possibly through autonomous affiliation with the larger companies. Breeding of vegetables and other minor crops must continue as a viable endeavor. Protective measures, especially patenting, must be moderated to eliminate coverage so broad that it stifles innovation. And in the farming domain, poverty among subsistence farmers and their consumers continues to exist and they must be aided by governments, international non-government organizations, and seed companies.

7. The role of professional and technical personnel for horticulture development

Horticultural industry level reflects the degree of human social progress and civilization directly. Especially, facility horticultural industry is the vehicle and realization of modern agriculture. Compared with other planting industries, the horticultural industry is a high-tech and knowledge-intensive industry which needs science and technology support, such as biology, engineering and ecology. In order to meet the needs of horticultural industry development, it is necessary not only to educate a large numbers of highly skilled production personnel but also to produce more professional and technical personnel.

Chinese breeders do a lot of work on collection, conservation and use of germplasm resources, breeding varieties and horticulture development. There are 16 national fruit germplasm repositories which including 11,000 fruit germplasm resources. Vegetable germplasm resources are more than 35,580 which have place the 3rd of the global. In the last decade, more than 1,400 vegetable varieties, 4,000 flower varieties and about 400 fruit varieties were developed or introduced. These varieties play important role for horticulture development. By understanding the demand of market, varieties can be more in line with market needs and preference of consumer and more easily to accept by the vast number of consumer. So it is necessary to understanding of the economic and social situation of horticultural industry.