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# Exploration and Enlightenment on Constraints of Modern Agricultural Construction in China

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**Abstract** On the basis of financial, scientific and technological, and resource factors constraining modern agricultural development, we analyze a series of effective explorations amid the plight of modern agriculture in China. Results show that significant achievements have been made through measures such as increasing agricultural investment, strengthening research and development and popularization of agricultural science and technology, enhancing infrastructure construction, and great improvement has been made in agricultural production, farmers' living, agricultural science and technology, agricultural industrialization and scale level of land. In line with these, we sum up following experience: insist on ensuring national grain security, increase agricultural investment to lay solid foundation for developing modern agriculture, speed up innovation in mechanism and system, and guide by different types through proper planning in accordance with local conditions.

**Key words** Modern agriculture, Constraints, Exploration, Enlightenment

The advance of modern agricultural construction is the objective trend of China's economic development and basic approach to promoting increase of farmers' income. Besides, it is an important measure to improve the integrated agricultural productivity, and inevitable requirement and fundamental way for China to realize the change of large agricultural country to powerful agricultural country. In 2007, Document No. 1 of the central government took the development of modern agriculture as impetus to the new socialist countryside construction. Therefore, in the crucial period of acceleration of transforming traditional agriculture and taking the road of agricultural modernization with Chinese characteristics, we must take effective measures to eliminate bottleneck on modern agricultural development and energetically develop modern agriculture.

On the basis of financial, scientific and technological and resource factors constraining modern agricultural development, we make an in-depth analysis of a series of effective explorations amid the plight of modern agriculture in China, in the hope of providing reference for the development of modern agriculture in developing countries.

## 1 Constraining factors of China's modern agricultural development

### 1.1 Financial problem

**1.1.1** The proportion of central finance fund for agriculture is still small. In 2010, the central finance expenditure on agriculture, farmers and countryside accounted for 16.93% of total amount of central finance expenditure, and less than 10% of

the government finance expenditure. However, the developing countries in the world input 15% of the total amount of finance expenditure on agriculture. In developing countries, such as Pakistan, Thailand and India, the proportion has reached 15% or above<sup>[1]</sup>. In the central finance expenditure on agriculture, farmers and countryside, the total amount reached 122.59 billion yuan in direct subsidies for grain producers, general subsidies for purchasing agricultural supplies and subsidies for purchasing superior crop varieties and agricultural machinery and tools. If distributed to farmers on average, the amount each farmer received from government subsidy took up only 2.91% of the farmers' per capita net income, while in Japan, farmers' half income comes from government subsidy.

**1.1.2** Rural finance fails to satisfy demand of modern agricultural development. In recent years, agricultural loan amount has shown the trend of strong growth, but capital demand of small and mini-sized enterprises and farmers is still not solved yet. In 2007, the loan balance in all financial institutions of China was 26.17 thousand billion yuan, and the agricultural loan was 1.54 thousand billion yuan (only accounting for 5.58%). About 50% rural enterprises and farmers that have credit demand fail to be satisfied from formal financial institutions, and have to seek help from non-governmental loan<sup>[2]</sup>.

**1.1.3** Farmers have limited capital to input to modern agriculture. For a long time, compared with rapid growth of disposable income of urban residents, farmers' income grows slowly. In 2010, per capita net income of Chinese farmers firstly exceeded the growth rate of disposable income of urban residents. However, it was still less than one third of the disposable income of urban residents (19 109 yuan). Excluding necessary production and living expenditure, farmers' disposal income is meager. Therefore, farmers' ability is very limited in inputting to modern agricultural construction, especially in large-scale infrastructure construction.

**1.2 Scientific and technological development of agriculture is difficult to satisfy demands of modern agricultural development** The progress in agricultural science and technology has made great contribution to China's agricultural production, but on the whole, the agricultural science and technology still lags behind the actual demands.

**1.2.1 Contribution rate of progress in agricultural science and technology and transformation rate of agricultural scientific and technological achievements are relatively low.** In China, the contribution rate of progress in agricultural science and technology has reached 41%. However, compared with 70% contribution rate in developed countries, there is still a big gap. The transformation rate of scientific and technological achievements is still at low level in China. The rate of scientific and technological achievements is only 42% in agricultural scientific research institutions and that in agricultural universities and colleges is only 37%, both of which are much lower than 70 to 80% in developed countries<sup>[3]</sup>.

**1.2.2** There are few people working in grass-roots science and technology popularizing organizations and the organization is not perfect. At present, the rural population of China is over 800 million, while only 460 000 people responsible for popularizing agricultural professional technologies. In other words, there are only 5 agricultural scientific and technologic popularizing workers for 10 000 rural population. In developed countries, such proportion is up to 30 to 40 persons for 10 000 rural population. What's worse, about 1/3 towns and 3/4 villages in China have not established grass-roots agricultural scientific and technological popularizing organizations<sup>[5]</sup>.

### **1.3 Increasing deterioration of resource and environmental problems**

**1.3.1** Serious shortage of cultivated land resource. With rapid development of China's economy and acceleration of industrialization and urbanization, as well as aggressive appropriation of cultivated land, the area of cultivated land is constantly decreasing. Director of Office of Central Rural Work Leading Group, Chen Xiwen, stated in the first "Urban-rural Land Forum" that the cultivated land in China reduced by 8.3 million hm<sup>2</sup> in the past 11 years from 1997 to 2007, which is greater than total area of cultivated land in China's major granary province Henan.

**1.3.2** Shortage of water resource and low utilization ratio. The total river runoff of China ranks the sixth in the world, but the per capita of river runoff is only about 1/4 of the world level<sup>[6]</sup>. Agriculture is a large consumer of water resource in China, and agricultural water consumption takes up over 63% of total water consumption of national economy. Shortage of water results in difficult irrigation of farmland. The irrigated area of unit cultivated land in China is only 19% of the world average level<sup>[7]</sup>, agricultural water shortage is about 30 billion m<sup>3</sup><sup>[8]</sup>, and the utilization rate of water for irrigation is only 43%, which is approximately 30% lower than the international advanced level<sup>[9]</sup>.

**1.3.3** Deterioration of ecological environment restricts development of agricultural production. The First National Pollution Source Census in China indicates that agricultural pollution

source is the largest contributor of chemical oxygen demand (OCD), the discharge amount takes up over 40%. Besides, agricultural pollution is also main source of discharge of total nitrogen (TN) and total phosphorus (TP). The discharge amount is 2.704 6 million tons and 284 700 tons respectively, accounting for 57.2% and 67.4% of the total discharge amount separately. Take nitrogen fertilizer as an example, China's cultivated land takes up 9% of the world cultivated land, but it consumes over 30% of the nitrogen fertilizer in the world. Excessive fertilizer is leaches into the ground or flows into water body along with sanitary sewage. Much nitrogen and phosphorus in livestock and poultry manure enter the water body and result in serious eutrophication<sup>[10]</sup>. The pollution of agriculture itself to environment leads to constant deterioration of ecological environment, which in turn restricts development of agricultural production.

**1.4 Backward level of agricultural infrastructure and equipment** Most existing agricultural infrastructure in China was built in the 1960s to 1970s. Since most of them have serviced for a long time and are not adaptable to serious impact of climate change, the agricultural anti-disaster ability is significantly reducing. In addition, the effective irrigated area of national farmland takes up only 49% of the cultivated land, so most cultivated land is still at the mercy of the forces of nature. Mechanized development of agriculture is less than satisfactory. There is still a big gap of agricultural mechanical level in different regions, industries, crops and operational sections. In many places, agricultural machinery is still not widely adopted due to terrain condition, economic development level and production concept. It can be seen that modern agricultural development is still faced with problems of backward farmland water conservancy irrigating facilities, low level of equipment, and low anti-disaster ability.

**1.5 Low agricultural industrialization level** In recent years, China has found out the approach to realizing intensified farming on the basis of small-scale production of farmer households through developing agricultural industrialization and the agricultural industrialization develops rapidly. Nevertheless, the effective connection mechanism has not been well established between farmer households and market; the ability of leading enterprises and farmers' professional cooperatives to spur farmer households is still very low; the intensive level of agricultural production is relatively low; the agricultural industrial chain is not long; the conversion ratio of added value of agricultural product processing is low, most agricultural and sideline products enter the market in the form of raw materials and primary products, there are few high added-value finished products. By contrast, the agriculture in developed countries has established the modern agricultural industrial system with the entire process closely connected. The processing rate of agricultural products exceeds 90%, and the labor force in processing section is greatly more than the labor force in agricultural production section<sup>[4]</sup>.

**1.6 Small scale of land restricts rise of agricultural labor productivity** According to statistics of Food and Agriculture Organization of United Nations, the present per capita land are-

a of Japan and South Korea is 7 times and 3.5 times of that of China. What's worse, the small-scale agricultural production and management greatly impede modern agricultural development. Small scale agricultural production not only leads to high production and transaction cost, influences fully utilization of labor force and agricultural fixed assets, but also restricts agricultural mechanization, specialization and popularization and utilization of modern agricultural production technologies. Consequently, the agricultural labor productivity of China is much lower than the developed countries. Besides, the agricultural labor productivity is only 1/8 of manufacturing industry and 1/4 of service industry<sup>[11]</sup>. In countries with well developed agriculture, the United States, for instance, takes up only 7% cultivated land of the world and 4.53% of the world population, but produces agricultural products with gross agricultural product (GAP) accounting for 12.6% of the GAP of the world. In other words, the capability of producing agricultural products exceeds 50% of the demand of its own country, and the per capita output of grain is three times that of China<sup>[4]</sup>.

### 1.7 Imperfect social service system

**1.7.1** The channel to obtain services is single. For a long time, Chinese farmers solve problems in the course of production and management mainly depending on themselves and grass-roots agricultural technology popularization departments. The channel to obtain agricultural technological service is single. Although the development of farmers' professional cooperatives takes on a growing trend, its role is still limited at present; and the coverage of agricultural education, research and development institutions and agricultural enterprises is relatively narrow. In 2007, the main departments providing services for agriculture were still grass-roots agricultural technological popularization organizations, accounting for 42.2% of the supply of agricultural technological services. The service provided by village-level organizations took up 36.3%, and the service provided by farmers' professional cooperatives, agricultural enterprises, agricultural scientific and technological research and development institutions accounted for 2.4%, 2.8% and 3.8% respectively<sup>[12]</sup>. Especially in fundamental technical guarantee for agriculture, such as fine seed breeding system, prevention and control system for plant diseases and insect pests, and animal epidemic prevention system, the equipment is backward, personnel is insufficient and stations are not uniformly distributed.

**1.7.2** Methods of services are backward. Since the 1970s, in foreign countries, the computer and information technology have increasingly been applied in agricultural field. The 3S technology (remote sensing, Geographic Information System, and Global Positioning System) is applied in monitor and forecast of agricultural resource environment, crop planting situation, and natural and biological disasters, as well as pushing forward the precise agriculture. Network technology also provides broad informatization service. In China, however, the agricultural information level is extremely low, and farmers get information still mainly from traditional media, such as television and radio.

### 1.8 Low quality and structural shortage of labor force

Domestic and foreign practice has proved that the modern agricultural science and technology will not be rapidly turned into productivity until they are grasped by modern high quality farmers. However, the existing situation of technological illiteracy seriously hinders the development of productive forces. In 2008, Chinese farmers with educational level above senior middle school took up only 15.8% of the total population of farmers. Low scientific and technology quality of farmers not only restricts farmers from finding opportunities and ways to get rich, but also hinders improvement of agricultural labor productivity and development of modern agriculture. Compared with agricultural production, migrant workers can earn much more, so numerous rural young farmers especially men labor forces, abandon farming and choose to work in cities. Most new generation farmers' children get away from rural areas through study or other methods. As a result, agricultural labor forces are mainly elderly people, women and children.

## 2 Exploration and effect in building modern agriculture

For a long time, Chinese government has made active exploration for modern agriculture and made every effort to eliminate bottleneck on development of modern agriculture.

**2.1 Firstly guaranteeing national grain security, to keep constant growth of grain output** China always takes guaranteeing national grain security as primary objective. To guarantee national grain security, following measures have been implemented. Firstly, direct subsidies for grain producers, general subsidies for purchasing agricultural supplies and subsidies for purchasing superior crop varieties and agricultural machinery and tools. Secondly, minimum purchase price policy. Thirdly, risk support policy. In the end of June of 2006, it began implementing the policy of subsidy for farmers, insurance companies and agricultural reinsurance. Fourthly, incentive support policy. In 2005, central finance issued the incentive policy for granary counties and gave substantial reward for top 100 counties of grain output or commodity rate, which greatly promotes rapid development of grain production.

In 2010, China was subjected to severe test of drought, flood and plant diseases and insect pests. The sown area of grain was 109.872 million hm<sup>2</sup>, 886 000 hm<sup>2</sup> greater than 2009, having an increase of 0.8%. The total grain output was 546.41 million tons, 15.59 million tons higher than 2009, having an increase of 2.9% and realizing grain output growth for seven consecutive years.

**2.2 Substantially increasing financial support for agriculture and exploring and establishing modern rural financial system**

**2.2.1** Steady increase of financial support for agriculture. It has basically realized continuous increase in total amount of financial support for agriculture and steady growth of support proportion. From 2006 to 2010, the central financial budget arranged for agriculture, farmers and rural areas increased from 339.7 billion yuan to 818.34 billion yuan, the proportion to cen-

tral finance rose from 14.5% to 16.93%. In 2010, the central financial support for agricultural production reached 342.73 billion yuan. The total amount reached 122.59 billion yuan in direct subsidies for grain producers, general subsidies for purchasing agricultural supplies and subsidies for purchasing superior crop varieties and agricultural machinery and tools. The subsidy for social cause development such as rural education and hygiene was up to 335.03 billion yuan, and agricultural product reserve and interest reached 57.62 billion yuan.

**2.2.2** Expanding coverage of rural financial institutions. To solve low coverage of financial institutions and lack of financial services in rural areas, the China Banking Regulatory Commission issued *Some Opinions on Adjusting and Relaxing the Access Policies for Banking Financial Institutions in Rural Areas and Better Supporting the Construction of New Socialist Countryside* at the end of 2006. On the principle of "low threshold and strict supervision", it is to guide various types of social capital to set up township banks, finance companies and rural mutual cooperatives in places where there are lack of services. By the end of March, 2011, 552 new rural financial institutions had been established around the country, including 500 township banks, 9 finance companies and 43 rural mutual cooperatives<sup>[13]</sup>.

**2.2.3** Reforming and innovating upon rural financial system. This is to provide loan guarantee for farmers to assist them in solving fund input problem in self-employment. Besides, it is to establish compensation system for agricultural loan, provide proper risk compensation for newly-gained agricultural loan, and encourage banks to increase loan for leading agricultural enterprises, farmers' professional cooperatives and farmers.

### **2.3 Enhancing construction of agricultural scientific and technological research and development, popularization and service system, to greatly improve agricultural productivity**

**2.3.1** Constantly increasing investment in agricultural scientific research projects. In 2007, China established 58 agricultural scientific research projects, the general budget for four years reached 908.11 million yuan. In 2008, the special Genetically Modified Organisms (GMO) project was formally implemented and 60 key projects were launched. In the mean time, the construction of advanced agricultural industrial technical system was launched for 40 major agricultural products, such as sugarcane and potato. In 2009, 58 public benefit industrial scientific research projects were approved by the Ministry of Agriculture, the total funds for five years reached 1.258 billion yuan. Relying on support of agricultural research and development funds and projects, take GM cotton as an example, during 2008 to 2009, it cultivated and approved 28 new types of GM cotton, popularized 7.466 67 million hm<sup>2</sup> area of GM cotton, having a net increase of benefit up to 13 billion yuan and reducing use of pesticide for 56 000 tons. It cultivated 78 new high yield, high quality and multi-resistant varieties, and innovated upon 9 954 types of new breeding materials.

**2.3.2** Strengthening construction of grass-roots agricultural technological popularization system. Firstly, it strengthened

knowledge training of grass-roots agro-technical personnel, and improved professional quality and working ability of agro-technical personnel. In 2009, 670 project counties in the whole country launched the village-level epidemic prevention person training. Totally, 30 000 village-level epidemic prevention persons received systematic training. Secondly, through innovating upon methods for popularizing agricultural technologies, it brought into full play functions of various and all levels of agricultural scientific research and education institutions, and aroused the enthusiasm of farmers' professional cooperatives, agricultural leading enterprises and various agricultural professional associations to participate in popularizing agricultural technologies. Thirdly, it valued the cultivation of practical skilled personnel in rural areas. In 2009, the central finance allocated 770 million yuan to build 770 demonstration counties in the whole country. Oriented towards leading industries including grain, economic crops, horticulture, animal husbandry and aquatic products industry, it selected 77 000 technical instructors, established 7 700 agricultural sci-tech demonstration bases, and cultivated 770 000 sci-tech model households, radiating 15 million surrounding farmer households. Fourthly, it realized multiple channels for popularizing agricultural information, and established agricultural management information service system, including agricultural information network, and information-oriented agricultural demonstration bases.

### **2.4 Implementing strict measures for management of cultivated land and energetically developing water-saving and ecological agriculture**

**2.4.1** Implementing strict measures for management of cultivated land. The *Outline of National Overall Planning on Land Use (2006 to 2020)* sets four restrictive targets, namely, total area of cultivated land, basic farmland protection area, scale of newly increased cultivated land for construction purpose, and demand for arranging and reclaiming supplementary cultivated land. Within the planned period, the protection area of cultivated land is expected to remain 121.2 million hm<sup>2</sup> and 120.3 million hm<sup>2</sup> in 2010 and 2020 respectively. And the protection area of basic farmland should be kept at 104 million hm<sup>2</sup>. Legal liability will be investigated and affixed for those parties who approve construction land use plan without authorization. In 2010, the Ministry of Land and Natural Resources and Ministry of Agriculture jointly issued *Notice on Strengthening and Bettering Relevant Works of Division of Permanent Basic Farmland*, stating that it should establish basic farmland database on the basis of results of the Second National Land Survey, to provide basis for dynamic supervision of basic farmland<sup>[14]</sup>.

**2.4.2** Energetically developing water-saving agriculture. In recent years, with increasingly short supply of agricultural water, the agricultural water-saving gradually extends to field, and agricultural organizations at all regions are actively exploring ways of farmland water conservation. In *Opinions on Promoting Development of Water-Efficient Agriculture* issued by the Ministry of Agriculture, it stipulates that all regions should conserve water in accordance with local actual situations, strengthen construction of farmland water-saving facilities, speed up popu-

larization and application of farmland water-saving technologies, and raise output of unit water resource. To promote farmland water conservation, the Ministry of Agriculture organized meetings for exchanging experience in farmland water conservation. In future, China will develop water-efficient agriculture on the basis of superior crop industry and speed up financial support for farmland water-saving projects.

**2.4.3 Encouraging development of ecological agriculture.** Take live pig breeding as an example, the government provides financial and technical support, encourages farmers to build methane-generating pit with excrement of pigs as fermenting materials. The generated methane can be used as fuel and lighting, and methane slag and liquid can be used for planting vegetables and fruits. This method not only solves environmental pollution resulted from livestock and poultry raising, but also reduces fertilizer consumption, and raises output of high quality agricultural products, forming benign cycle of agricultural ecology. In 2009, central government invested 5.2 billion yuan for methane projects in rural areas. The whole country had 5 million new methane users (totally reaching 35.07 million households), and 56 500 agricultural waste methane works were built. Annual methane output in rural areas reached 13 billion  $m^3$ . The methane actually used was equivalent to 21.6 million tons of standard coal, annually increasing income and economizing on spending for 17 billion yuan for farmer households. The central finance invested 700 million yuan in building methane service sites in rural areas. In addition, it encourages application of pest prevention using biological method. For example, use trichogramma to prevent and control corn borer. The effect is good and it successfully prevents pest from breeding and reduces use of pesticide.

## 2.5 Speeding up construction of agricultural infrastructure, improving material equipment of modern agriculture and agricultural production conditions

**2.5.1 Energetically developing construction of water conservancy works.** By the end of November of 2009, the investment in construction of water conservancy works has reached 60.45 billion yuan in the whole country. In 2009, about 793 870  $hm^2$  middle-and-low-yielding field was transformed, which greatly improved integrated production capacity of agriculture and anti-disaster ability. By the end of 2009, the effective irrigation area has reached 59.261 4 million  $hm^2$ , 4.86% over the 2007; an area of 104.544 million  $hm^2$  soil erosion land was controlled, which has an increase of 4.68%. The facility agriculture develops more rapidly. In 2008, the whole country invested 120 billion yuan in newly increasing facility area (up to 350 000  $hm^2$ ). According to the plan of 2009, the facility agriculture would develop to 2.67 million  $hm^2$  in 2010.

**2.5.2 Actively pushing forward agricultural mechanization.** In 2009, the total power of agricultural machinery reached 874.5 million kW in the whole country, 14.24% over the 2007. Large and medium-sized agricultural tractor reached 3.515 million sets and 1.75 million sets respectively. Mechanization level of agricultural crops was significantly lifted, and overall mechanization rate of cultivation, sowing and reaping reached 49%.

**2.5.3 Strengthening construction of rural highway, electric network, drinking water and communication equipment.** It is required to strengthen rural highway maintenance and management, and improve the mechanism for rural highway fund-raising construction and maintenance. Besides, it continues to push forward transformation and construction of rural electrical network, implementing the policy of urban and rural areas having the same network and the same price, speeding up the project of sending electricity to every household, and implementing electrical construction in new areas. In 2009, the problem of drinking water safety was solved for 60.69 million rural people. In addition, it built or rebuilt 380 000 km rural highway, realizing that 99.8% administrative villages and 93.9% villages which have households more than 20 connected with telephone, 96% villages connected with broadband network and 91% administrative villages can access to network.

**2.6 Actively developing agricultural industrialization, boosting land circulation, and promoting increase of farmers' income** Chinese government actively pushes forward development of agricultural industrialization through policy support and technological guidance. Firstly, set up special fund to support agricultural industrialization. In 2009, China supported 4 056 agricultural industrialization projects, built 27 600  $hm^2$  high-quality and high-efficient agricultural planting bases, and developed over 4 200  $hm^2$  area of aquaculture. Secondly, determine regional leading industry. China encourages all regions to make proper distribution in accordance with economic regions and climatic regions, and to cultivate influential leading industries. Thirdly, preferentially support national-level and provincial-level leading enterprises which have significant demonstration function and great role in promoting increase of farmers' income, especially development of deep-processing enterprises. Fourthly, support construction of production base of superior agricultural products and agricultural professional cooperatives. By 2009, the Ministry of Agriculture has totally arranged 190 million yuan to support this.

Through constant exploration and practice, the quantity of agricultural industrialization organizations increases rapidly and the promotion effect on increasing farmers' income is significant. In 2010, the total quantity of various agricultural industrialization organizations reached 250 000, brought along 107 million farmers and realized average annual increase of farmers' income up to 2 100 yuan, 11.6%, 3.8% and 9.1% over the previous year respectively. Farmers' professional cooperatives also emerge rapidly in large numbers. In the end of 2009, the farmers' professional cooperatives reached 246 400, which doubled the previous year. Generally, every three villages had one farmers' professional cooperative. In addition, with promotion of leading enterprises and cooperatives, farmers' land is put together, which effectively pushes forward land circulation and large-scale operation of land.

**2.7 Strengthening cultivation of new farmers and constantly improving farmers' living conditions** Farmers are subjects of building modern agriculture. To realize agricultural modernization, we should cultivate new and high quality farm-

ers having ability of increasing income through science and technology, market operating ability and specialized production ability, and finally turn human resources into human capital. In the first place, implement scientific and technological training works for new farmers. In 2008, about 670 counties and 33 000 villages implemented scientific and technological training works for new farmers. About 1.5 million farmers received technical training. Some farmers became "land experts", "field experts" or other experts. Consequently, they promoted increase of surrounding farmers' income and made surrounding farmers get rich. In the second place, encourage farmers to take technologies and funds to come back to hometown for starting an undertaking, and become leaders of building modern agriculture. In the third place, provide pre-job training for migrant workers. To improve quality of migrant workers, the government and all relevant departments carried out "sunshine works". In 2009, totally 30 million people received training, which was 7 times of the previous year. In 2010, China formulated new planning for training migrant workers, and about 6 million migrant workers received training, each person had training subsidy of about 800 yuan.

Constant emergence of new migrant workers plays a greater and greater role in bringing along surrounding farmers, making their income greatly increase and living conditions greatly improved. In 2010, the per capita net income of rural people was 5 919 yuan, which had an increase of 766 yuan over the previous year (having an increase of 14.9%). Excluding influence of price factor, it actually increased 10.9%, and the growth rate is 2.4% higher than the previous year. Constant increase of income provides solid foundation for improving living conditions of rural people, and farmers' consumption obviously increases. In 2010, living consumption expenditure of rural people was 4 382 yuan, 388 yuan higher than the previous year (having a growth rate of 9.7%). Excluding the price factor, it actually increased 5.9%. In these, the commodity expenditure was 3 120 yuan per capita, having an increase of 282 yuan (the growth rate was 10%). The service expenditure was 1 262 yuan per capita, having an increase of 106 yuan (the growth rate is 9.2%).

### 3 Enlightenment on modern agricultural construction of China

The development of modern agriculture in China is constrained by many factors, including agricultural infrastructure, scientific and technological level, natural resources and land scale, etc. During this exploration, China realizes rapid development of agriculture and national economy, realizes self-sufficient grain, and sets an example for many developing countries and regions in the world. Therefore, it is worth summing up successful experience of China in developing modern agriculture, to provide reference for these countries and regions.

**3.1 Insisting on ensuring national grain security** Currently, the whole world has a higher and higher requirement for agricultural development. In the new trend of ensuring national grain security and providing industrial raw materials, we should

insist on realizing self-sufficient grain, putting the grain production in the first place, and ensuring national grain security. On the basis of these, it is required to expand multiple functions of agriculture, energetically explore sightseeing, recreational and cultural continuity functions, and gradually extend breadth and depth of agriculture, to satisfy people's increasingly diversified consumption demand.

**3.2 Increasing agricultural investment to lay solid foundation for developing modern agriculture** In the course of building modern agriculture, it is required to make clear the key point of agricultural input. To begin with, we should increase input in agricultural science and technology. For example, we should support research of agricultural fundamental science, basic project of biological engineering, research and breeding of high quality agricultural crops and livestock products, establish stations for popularizing agricultural science and technologies, and cultivate sci-tech model household and technical leaders. Next, we should strengthen agricultural infrastructure construction, upgrade irrigation and water conservancy facilities and construction of auxiliary projects, and reinforce rural public facility construction. In addition, we should increase investment in rural elementary education, vocational education and adult education, to improve quality of farmers. Finally, we should strengthen the support for agricultural product quarantine service system, to ensure people's life and health.

**3.3 Speeding up innovation in mechanism and system** In the course of modern agricultural development, firstly, we should reform and innovate upon rural financial system, expand coverage of rural financial institutions, provide proper risk compensation for newly increased agricultural loan, and encourage them to increase support for leading agricultural enterprises, farmers' professional cooperatives and farmers. Secondly, we should strengthen innovation in agricultural scientific and technological popularization system, relying on scientific research institutions, taking leading enterprises and cooperatives as carriers, and taking farmers as beneficiaries. Thirdly, we should innovate upon and improve land circulation system. On the legal, voluntary, paid and orderly principle, it is expected to realize large-scale operation of land through cooperative shares of land, large household operating through contracting and industrialization management. Fourthly, we should speed up innovation in the form of farmers' organizations. We should accelerate construction of agricultural leading enterprises, farmers' professional cooperative economic organizations, and agricultural industrial associations. It is expected to bring into play the due functions in market access, information consultation, standardizing operating activities, coordinating prices, settling disputes over benefits, and investigation of industrial damage, etc., to ensure legitimate rights and interests of farmers and enterprises.

**3.4 Guiding different by types through proper planning in accordance with local conditions** Modern agricultural construction is a huge systematic project. It has wide coverage and great work load. Therefore, at the same time of building modern agriculture, it is required to build modern agriculture in

product safety. However, the current regulatory departments are not strict in enforcing the law, so that some companies make a reckless move at the cost of the life safety of the consumers. The promulgation of *Food Act* on February 28, 2009, is only a small step in the construction of this system. In the process of implementing this act, all regions should pay close attention to the factors related to food safety at home and abroad, according to the actual situation, emulate the foreign countries to establish supporting punitive damage compensation system, to earnestly safeguard the interests of consumers. There must be laws to go by, the laws must be observed and strictly enforced, and lawbreakers must be prosecuted. The dairy departments should formulate the enforcement regulation, in accordance with *Food Act* in China. The two most important links are quality safety inspection of dairy cow feed and milk station management. Through the establishment of independent third-party feed testing organizations, the government should realize full control over the process of dairy cow breeding. In addition, in the process of breeding, we should carry out the experimental work of GAP, HACCP system certification; pay attention to the role of the media and public opinion.

A good environment for dairy development is inseparable from

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accordance with market rules, and carry out pilot works and demonstration. The pilot and demonstration take the city or county as units. It is preferred to select better agricultural basic conditions, influential economic power, and leading team. Through establishing modern agricultural demonstration area and exploring course and experience to provide reference and experience for local government. Finally, in view of unbalance of agricultural productivity level in different regions, when implementing policies and guidance, it is required to uniformly bring into play superior advantages of local resources, respect farmers' desire and take construction of modern agriculture to guidance to different types of areas.

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