Value and Development Countermeasures for Modern Agriculture in Suzhou

Weidong JIN *

Suzhou Institute of Rural Cadre, Suzhou 215011, China

Abstract With advance of urbanization and industrialization, modern agricultural development in China's economic developed areas (CEDAs) is greatly restricted by traditional concept. To speed up the development of modern agriculture in CEDAs, this paper takes Suzhou City as an example from theories supporting modern agricultural development. It demonstrates agriculture in CEDAs plays an important role in adjusting supply of agricultural and sideline products, reserving rural labor employment, protecting ecological environment, increasing farmers' income, and passing on agricultural culture. It contends that CEDAs should take reserving basic farmland as prerequisite; take adequate supply of primary agricultural products, protection of living environment, maintenance of agricultural landscape, and inheritance of farming culture as objectives; establish perfect modern agricultural system through firmly setting up modern agricultural value concept; increase local public finance input; increase agricultural functional value from technical and management levels, to realize increase of farmers' income, promote sustainable development of agriculture, promote integrated urban and rural development, as well as harmonious development of human and nature.

Key words China's economic developed areas (CEDAs), Modern agriculture, Multi-functionality of agriculture, Externality, Ecosystem value, Development countermeasures

1 Introduction

From connotation characteristics of foreign modern agriculture, Chinese economic developed areas (CEDAs) have resource elements necessary for upgrading from traditional agriculture to modern agriculture. However, the modern agricultural development in these areas is still beset with difficulties and agricultural production shrinks day by day. This brings a great hidden trouble to food security and sustainable development of these areas. Thus, it is necessary to analyze agricultural functional value of these areas in detail, to provide a new perspective for decision of local government of these areas in developing modern agriculture.

2 Theories influencing forming of modern agricultural value concept

2.1 Multi-functionality and strategic position of agriculture

The agricultural multi-functionality means that agriculture also has environmental and social functions related to non-commodity output such as rural environment, landscape and biological diversity, farmers' living and employment, food quality and hygiene, national food security and agricultural cultural inheritance, apart from providing economic function related to commodity output such as food and fiber[1]. At the beginning of the 1990s, this concept firstly appeared in important documents of UN, such as *Agenda* 21 passed in 1992 United Nations Conference on Environment and Development, and *Rome Declaration on World Food Security* passed in 1996 World Food Summit Plan of Action[2]. In developed countries, Japan, South Korea and EU countries are the earliest promoters and practice countries of this theory. Vice-premier Hui Liangyu summarizes agricultural multi-functionality: food security, raw material supply, employment and income increase, ecological protection, sightseeing and cultural inheritance. Agricultural multi-functionality indicates unshakable strategic position of agriculture.

2.2 Externality theory and agricultural externality

The externality, also called external effect or spillover effect, mainly refers to the effect of an economic entity on welfare of bystanders. Such effect occurs not in the exchange based on price between relevant parties, so the effect is external. The existence of externality has important effect on resource allocation. Economists solve externality problem mainly through public policies and private approach. Public policies mainly include government control, government providing public goods, collecting taxes and providing subsidies; private approach includes moral constraint, charity action, and interested parties signing contracts, as well as business amalgamation[3-4]. With acceleration of industrialization, urbanization and internationalization in CEDAs, the role of agricultural externality becomes bigger and bigger in agricultural development. (1) Farmers' income and reproduction plan are more likely to be influenced by transaction of agricultural products or agriculture-related industrial market changes. (2) Such positive externality of agriculture increases social welfare, but farmers are not benefited. As a result, farmers' enthusiasm is dampened and agricultural production shrinks. (3) The area source pollution and point source pollution resulted from traditional agricultural farming are still major factors of water eutrophication. Such negative externality of agricultural production may be minimized by sci-

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* Corresponding author. E-mail: jinweidong@ngy.js.cn

entific cultivation method. However, due to limit of fund, farmers fail to use the scientific method. (4) The negative externality of industrial production leads to increasing deterioration of ecological environment, increasing public nuisance, and influences agricultural production, farmers' living and rural economy. Therefore, it is urgent to solve the problem of agricultural externality.

2.3 Agricultural ecosystem service and the evaluation of its value Ecosystem services refer to benefits obtained by human beings from ecosystem, including supply, adjustment and culture and support functions. With increase of environmental pressure, people gradually realize the value of ecology. In 1997, Robert Costanza *et al*. initially designed the value mode of global ecosystem serving human beings, and they believed that the value of ecosystem services is 1.8 times the global GNP[5]. On March 30, 2005, *Millennium Ecosystem Assessment* (MA) was formally issued. It lays great stress on ecosystem service functions. It contends that people should consider common weal of human beings and internal value of ecosystem. In recent years, function value of ecosystem service has received widespread attention and becomes major basis of ecological compensation. Ouyang Zhiyun obtained that the economic value of Chinese land ecosystem service is 1.48×10^{14} yuan/year, which is 6 times China's GDP in 2007[6].

Most parts of economic, ecological and social value of farmland ecosystem can be quantified. In some economically developed cities, such work has been launched. The evaluation conducted by Yang Zhixin *et al*[7] indicates that the total service value of ecosystem in suburbs of Beijing has a reduction of 24.1% in 2002 compared with 1996 due to dramatic reduction of cultivated land. Research of Li Feiyun *et al*[8] shows that total service value of farmland ecosystem in suburbs of Shanghai during 2000 – 2004 increases 6.23%, while the ecological value continuously falls with annual reduction rate of 6% and 4% in cleaning air and conserving water. From the above researches, we know: (1) agriculture and farmers assume the responsibilities of protecting cultivated land resource and maintaining regional ecological environment. (2) Value of agricultural products can be provided by other regions, but ecological and social functions can' be replaced by other regions. (3) With drastic reduction of cultivated land, ecological maintenance and defense function drop greatly in CEDAs. Therefore, protecting farmland and agriculture in the process of industrialization and urbanization is in fact protecting their living environment.

3 Irreplaceable function value of agriculture in CEDAs

3.1 Adjustment and alleviation function of supply of agricultural and sideline products Now, Chinese agricultural and sideline products have basically formed a large circulation pattern, and the state reserve is also abundant. At the general level, China's food security will be no problem. However, at the regional level, it can not exclude uncertain factors. With sharp reduction of cultivated land in these areas, it is impossible to realize self-sufficiency of agricultural products. In this situation, it is required to bring into play functions of local agricultural and sideline products in adjusting market and alleviating the conflict of market supply. This is vital to social stability and needs special attention of government at all levels. Suzhou is large city determined by the State Council. In 2007, its GDP was 570 billion yuan, among which agriculture accounts for only 1.7%. The population density is 2 305 people/km^2 (not including unregistered people from other places). The cultivated land there reaches 239 650 hm^2. Recently, with acceleration of industrialization, urbanization and internationalization, there is a greater reduction in scale of grain production and supply guarantee rate of the whole city. In 1978, the grain production area was 636 610 hm^2 and the total yield reached 2.942 million tons, making Suzhou become one of major commodity grain production areas. In 2007, the grain production area dropped to 153 450 hm^2 and the total yield fell to 1.07 million tons. At the same time, the total grain consumption in Suzhou was up to 3.595 million tons, and the grain ration (excluding population growth factor) is less than 1/3, making Suzhou change to main demand region. If calculating people from other places, the per capita grain yield is less than 100 kg. Huge increase in agricultural byproducts (such as livestock and poultry, aquatic products and melons and fruits) has greatly enriched supply of agricultural products, but the pressure of agricultural product market circulation is still very high. In the event of big natural disaster, sudden animal epidemics or unsmooth circulation channel, local agricultural and sideline products will have to assume the responsibility of alleviating market supply conflict and stabilizing citizen's living.

3.2 Absorption and reservation functions of rural labor employment Some scholars have predicted that it is more difficult for China to solve the problem of farmer employment in the 21st century than to solve the food problem of whole people in the 20th century[9]. Table 1 shows the relationship between GDP growth and employed people growth in Suzhou during 2001 – 2007. This is possibly resulted from the industrial structure of Suzhou in recent years. With the transition from "Suzhou Made" to "Suzhou Created", low quality people will have greater difficulty in employment. Experience of developed countries indicates that employment elastic coefficient gradually drops with increase in organic structure of capital. Solow Growth Model shows that technological progress rate, capital input growth rate and labor output elasticity growth rate are negatively correlated with the employment, because labor-saving and capital-intensive economic growth bring about crowding-out effect on employment and reduce GDP employment elasticity. Therefore, the employment pressure of Suzhou can not be neglected and rural labor employment problem will become more and more prominent. Suzhou's economy is typical export-oriented economy. Foreign-owned enterprises provide many jobs, but the requirement is also high for labor quality. In this situation, local laborers fail to meet this requirement, especially those land-requisitioned farmers. Urban laborers' quality can't satisfy demand of foreign and domestic new high-tech enterprises. In recent 10

years, many university students, postgraduates and other high talents come to Suzhou labor market, and have obtained these jobs relying on their high cultural and technological quality. In Suzhou, the registered workers from other places reached about 6 million. Therefore, it is impossible for rural labors to move to other industries, and it needs reliance on developing modern agriculture to expand employment field.

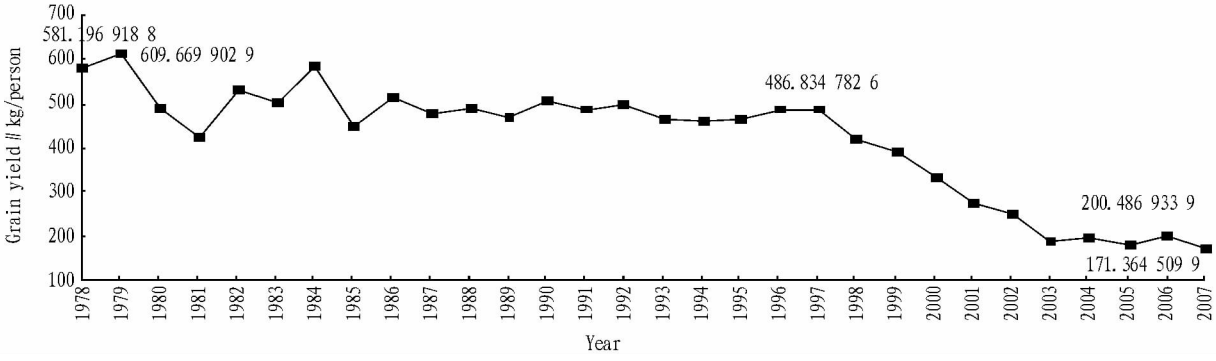

Fig. 1 Annual per capita grain yield of Suzhou City in 1978 – 2007

Table 1 The relationship between GDP growth and employed people growth in Suzhou during 2001 – 2007

	2001	2002	2003	2004	2005	2006	2007
Annual growth of GDP// %	12.3	14.5	18.0	17.6	15.3	15.5	16
Employed people// 10^4	321.96	323.75	346.19	358.82	393.72	429.46	483.4
Annual growth of employed people// %	2.57	0.56	6.93	3.64	9.72	9.1	12.6
Workers at their posts// 10^4	73.45	74.16	81.09	87.18	100.44	111.39	122.97
Annual growth of workers at their posts// %	−0.86	0.97	9.34	7.51	15.21	10.90	10.40
Employment elastic coefficient	0.209	0.386	0.385	0.207	0.635	0.587	0.788
Urban registered unemployment// %	3.65	4.08	3.93	3.69	3.42	3.22	3.0
Urban registered unemployment in whole country// %	3.6	4.0	4.3	4.2	4.2	4.1	4.0
Urban registered unemployment in Jiangsu// %	3.6	4.2	4.1	3.9	3.6	3.4	3.19

3.3 Protection and support functions of ecological human settlement In CEDAs, there are following problems: (1) increasingly prominent tropical island effect; (2) increasingly heavy task of domestic rubbish and sewage disposal; (3) gradual reduction of flood prevention and water storage; (4) increasingly severe water, soil and air pollution; (5) gradual disappearance of traditional local agricultural resources. With the publication of MA report, the value of farmland ecosystem is clearly upheld before us. The contribution of agriculture to cities and surrounding human settlements is irreplaceable. Suzhou is a well-known "land of fish and rice" and "Human Paradise on Earth". However, with economic development, urban expansion and population concentration, environmental problem is unevadable. Situated in network of rivers, Suzhou is small in city scale. In addition to large area of greening projects in recent years, the tropical island effect is not as prominent as Shanghai and Beijing. But the task of disposing domestic rubbish and sewage is heavy. In 2000, the daily disposal amount was 1 000 tons, but in 2007, it rose to more than 3 000 tons. Water pollution in Suzhou is serious, and it has become a city of short of high quality water. With dramatic decrease of rice production area, the big flood prevention ability in plum rain season is falling. What's worse, deteriorating heavy metal pollution of soil threatens quality of agricultural products. This greatly influences living environment of urban and rural residents. To control such situation relying on industrialized methods, the economic cost is astonishing and it is impossible to realize the goal. Farmland is like lung absorbing CO_2 and releasing O_2, like stomach reserving water for preventing floods, and like kidney cleaning air, soil and decomposing part of domestic sewage.

3.4 Functions of increasing farmers' income and narrowing the income gap between urban and rural residents Developing modern agriculture is an important approach to narrowing income gap between urban and rural residents in CEDAs and increasing farmers' income. In 2007, per capita net income of rural residents in Suzhou was 10 300 yuan, but the urban and rural income gap is widening, as shown in Table 2. From the income structure, it can be known that wage income is the major part of farmers' income (higher than 60%), mainly because surplus rural labor forces moving to non-agricultural industries. But the growth of wage income is difficult: (1) It is more difficult to move surplus rural labor forces. By the end of 2006, about 83.2% rural labor forces in Suzhou were moved, and those who did not move are mostly women and old people. At the same time, the adjustment of economic structure and upgrade of industrial structure impose new requirement for rural surplus labor. They have to improve their technical ability and cultural quality, so it is more difficult for them to satisfy demand of labor market. (2) The employment pressure is increasing, labor quality is low, and it is difficult to increase wage and improve conditions. Enterprises prefer to employ migrant workers who ask lower wages, thus local farmers

will have higher employment pressure. In addition to their low quality, the wage growth has to rely on the increase in urban minimum wage. (3) Developing rural secondary and tertiary industries is another channel to increase farmers' income, but most farmers lack skills and funds, so it is still difficult for them to develop and open up new ways of increasing income. In this situation, it has to develop modern agriculture, extend agricultural industrial chain, increase agriculture-related jobs, and increase added value of agriculture, to increase farmers' income.

Table 2 Per capita income of urban and rural residents in Suzhou during 1996 – 2007

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Per capita income of urban residents // yuan	6 591	7 479	7 812	8 406	9 274	10 515	10 617	12 361	14 451	16 276	18 532	21 260
Per capita income of rural residents // yuan	4 574	4 924	5 089	5 248	5 487	5 790	6 140	6 750	7 460	8 393	9 316	10 300
Ratio of urban and rural residents' income	1.44	1.52	1.54	1.60	1.69	1.82	1.73	1.83	1.94	1.94	1.99	2.06

3.5 Inheritance function of traditional culture and agricultural landscape China is a large agricultural country, and farming culture has nourished generation of Chinese people. Urbanization should not eliminate agriculture, and city and agriculture can coexist. Farmland landscape is beautiful, so urban residents can go there for leisure. Residents can take planting, maintenance and picking activities. For young people, this is another kind of education; for the elder, this is leisure and memory. With development of contemporary ecological science, people start to care about ecological environment in cities and pay attention to protecting primitive agricultural environment. In urban construction, urban farmland can make use of waste land, which greatly reduce the operation cost and minimize relocation cost. Table 3 compares the cost benefit of 3 hm^2 urban park and urban farmland in residential communities with 2 500 children surrounding UK Parliament[10]. It can be seen that keeping agricultural landscape is not only economic but also hope of modern people.

Table 3 Cost and benefit comparison between urban farmland and park

	Investment Pound	Relocation cost // Pound	The 1st year operation cost // Pound	Annual visit of adults // people	Annual visit of children // people
Urban park	75 000	24 000	10 176	0	35 000
Urban farmland	5 690	20	4 200	19 000	49 640 organized and 25 000 random

4 Ideas and countermeasures for modern agricultural development in CEDAs

Agriculture plays an irreplaceable role in sustainable development of CEDAs. It should take proper modern agricultural development road according to local resources and natural endowment. Western developed countries are also like this: the Netherlands and Israel take the road of increasing land productivity and planning high added value agricultural products due to large population but little land; the USA, Canada, and Australia take the road of increasing agricultural productivity and total yield of agricultural products through agricultural mechanization due to small population but much land and serious shortage of labor forces. Thus, there is neither unified model, nor unified standard for the modern agriculture[11]. But 4 agricultural indexes of developed countries are worth learning. (1) The contribution rate of science and technology to agriculture is higher than 80%; (2) The commodity rate of agricultural products is more than 95%; (3) Agricultural input takes up more than 40% of the total output of agriculture in current year; (4) Agricultural labor accounts for less than 20% of the total labor in the whole country. CEDAs should learn foreign modern agricultural theories and practice, make strategic arrangement for developing modern agriculture, and realize the leapfrog development with the aid of newcoming advantage.

4.1 Basic ideas for modern agricultural development in CEDAs CEDAs should take protecting basic farmland as prerequisite; take adequate supply of primary agricultural products, protection of living environment, maintenance of agricultural landscape, and inheritance of farming culture as objectives; establish perfect modern agricultural system through firmly setting up modern agricultural value concept; increase local public finance input; increase agricultural functional value from technical and management levels, to realize increase of farmers' income, promote sustainable development of agriculture, promote integrated urban and rural development, as well as harmonious development of human and nature.

4.2 Countermeasures for modern agricultural development in CEDAs

4.2.1 Setting up modern agricultural value concept, to provide ideological guarantee for developing modern agriculture. Setting up modern agricultural value concept is not only to solve the problem of whether to develop agriculture or not, but more important is to find out how to develop modern agriculture. Modern agricultural value theories include agricultural multi-functionality, externality and ecosystem value theories. These theories greatly expand our vision of agriculture. Agricultural economic value includes production value of primary products, ecological value and living value. Agriculture is not only an economy, but also a common entity.

Thus, it should know the necessity of agricultural input and reasonableness of agricultural subsidy. Otherwise, it will lead to "Tragedy of the commons". Fig. 2 is just logic action within the frame of such value system. To set up modern agricultural value concepts, it should (1) evaluate agricultural ecosystem value and quantify agricultural ecological value and living value; (2) explore farming culture, rescue agricultural intangible cultural heritage; (3) energetically implement popular science propaganda, education and discussion to change the attitude of society towards agriculture and to establish sustained attention to agriculture; (4) take strict regulations and systems as necessary, for example, establish government performance evaluation system to carry out economical reward or penalty.

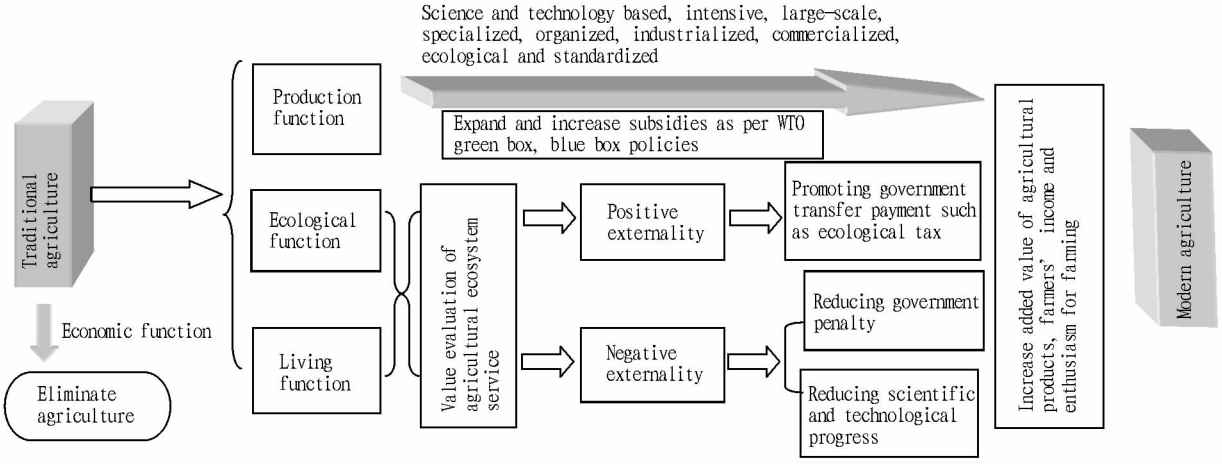

Fig. 2 Logic actions of CEDAs within the frame of modern agricultural value system

4.2.2 Exploring modern agricultural institutional arrangement to provide system guarantee for developing modern agriculture. From traditional agriculture to modern agriculture, it is the process of agricultural productivity improvement, and certainly the process of production relationship development. Establishing modern agricultural system is to arrange agricultural institution suitable for modern agricultural productivity. This belongs to institutional innovation. CEDAs should base on developing socialist market economy, orient towards commercialization and market, and make effort to eliminate restrictions, to provide juridical practice for revision and improvement of agriculture-related laws.

4.2.3 Increasing local financial support and subsidy for agriculture to provide fund guarantee for developing modern agriculture. Agricultural subsidy is a kind of transfer payment for agricultural production, circulation and trade. This is also a general method in developed countries. *WTO Agreement on Agriculture* passed in 2004 divides agricultural subsidy into green box policy and yellow box policy. After the agreement comes into force, developed countries take advantage of subsidy policies to increase direct subsidy for farmers' income. For example, Japanese agricultural subsidy has exceeded agricultural revenue, the expenditure of EU on agriculture accounted for near a half the budget of last year in 2005, and the United States also substantially increases agricultural subsidy[12]. China has implemented a series of preferential policies and support policies, including exemption from agricultural tax, direct grain subsidy, grain seed subsidy, and subsidy for agricultural machinery and tools. However, due to limited national power, these subsidies are very few compared with developed countries. At the same time of implementing state policies of benefiting and supporting agriculture, CEDAs should expand and strengthen subsidy in accordance with WTO green box policy.

4.2.4 Building modern agricultural technical support system to provide sci-tech guarantee for developing modern agriculture. At the technical level, modern agriculture has following technical features: (1) continuous breakthrough and industrialized production of agricultural biological technology becomes motive force for agricultural industrial upgrading; (2) widely-applied information technology brings agriculture gradually controllable; (3) food making technology with deep processing of agricultural products as major part develops violently, making agricultural industrial chain continuously extend; (4) rapid development of agricultural equipment technology constantly improves means of agricultural production; (5) sustainable and ecological agricultural production receives more and more attention; (6) new high technologies, such as material technology, aerospace and nuclear technologies are widely applied in agricultural field[13]. Therefore, it should establish agricultural research institute, adjust functions, energetically carryout application researches, introduce and absorb new technologies, cooperate with basic research organizations, and administrative relationship should be under the jurisdiction of agriculture competent authority; establish agricultural industrial information center, consolidate and analyze agricultural information, provide consultation services for government making decisions, and provide information service for society; adjust agricultural technical extension service system; stimulate agricultural enterprises to make innovation; and set up agricultural sci-tech parks.

4.2.5 Developing ecological urban agriculture to provide direction guarantee for developing modern agriculture. When developing modern agriculture, CEDAs should consider both rural areas and urban areas. Thus, its agricultural form should integrate eco-

logical agriculture and urban agriculture, in other words, it is ecological urban agriculture. Ecological agriculture stresses bringing into overall function of agricultural ecosystem. Besides, it is required to combine developing grain and cash crops, large farmland planting and forestry, animal husbandry, sideline production and fishery, large agriculture and secondary and tertiary industries. In addition, it is recommended to take advantage of quintessence of traditional agriculture and achievements of modern science and technology, follow the principle of "integration, coordination, cycle and regeneration", and coordinate conflicts between development and environment, resource utilization and protection, to realize benign cycle in both ecology and economy, and integration of economy, ecology and society.

4.2.6 Adopting advanced agricultural operation management method to provide efficiency guarantee for developing modern agriculture. For developing modern agriculture, the key is to improve integrated allocation ability of agricultural and social resource elements. In other words, it is required to transform traditional agricultural operation and management model. Scientific management is the most distinct feature of modern agriculture. In my opinion, this feature is more important than technical characteristic of modern agriculture. Intensive production, specialized labor division, organized operation, socialized service and market-oriented circulation are specific indications of scientific management idea of modern agriculture. It is also specific practice connotation of agriculture under the guidance of industrial idea: (1) comprehensively train new farmers to improve their quality and provide forces for implementing management measures of modern agriculture; (2) energetically develop farmers' professional cooperatives and enhance farmers' organization, to resist agricultural risks and improve agricultural specialization; (3) establish effective agricultural product market system. On the one hand, it should ensure regional grain security. On the other hand, it should improve commercialization level of agricultural products, extend agricultural industrial chain, provide more jobs for farmers, and increase added value of agricultural products.

5 Conclusions

The *Report to Seventeenth National Congress of the CPC* takes "ecological civilization" as new requirement for the objective of building a well-off society in an all-round way. The ecological civilization is the sum of material and spiritual achievements obtained by human beings through following the principle of harmonious development of human and nature, and promoting social, economic and cultural development. It contains the value concept of harmonious development of human and nature, production value concept of sustainable development of ecosystem, and consumption value concept of satisfying self development without harming nature. CEDAs should not only become forerunners of material civilization development, but also become pioneers of ecological civilization. Building modern agriculture and developing modern agriculture are the most realistic measures for practicing ecological civilization.

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