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Evaluation and Overview of Progress in Farmland Protection Researches

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Abstract With rapid advance of urbanization in China, both quantity and quality of farmland are gravely threatened, human-land conflict is growing, and the issue of grain security becomes more serious. Accordingly, practical and feasible protection of farmland has become one of core problems in China's land resource management. From theory, system, effective factors and measures and methods of farmland protection, this paper comprehensively analyzes research achievement and progress in farmland protection, in the hope of providing basis for further in-depth research of farmland protection in China.

Key words Farmland protection, Farmland protection system, Influence factors, Evaluation and overview

1 Introduction

China is large in population but deficient in farmland resource. Generally, China's farmland resource can be characterized by improper distribution, poor overall quality, and low productivity. In recent years, with rapid socio-economic development and extensional expansion of cities, much farmland is occupied. At the same time, since China's population base is huge, total population still grows at annual speed of tens of millions, leading to gradual shrinkage of per capita farmland and more and more prominent human-land conflict. Both quantity and quality of farmland resource influence grain security of a country or region, and then influence social stability and economic development of the country or region. In the increasingly complicated international environment, international grain market fluctuates frequently, grain price constantly rises, then, grain security attracts more attention. Therefore, it is significant to study how to effectively protect farmland resource, properly utilize every parcel of land, and maintain China's sustainable socio-economic development. In view of this, we made evaluation and overview of domestic researches on farmland protection, in the hope of further improving farmland protection theories and building research framework.

2 Basic theoretical researches of farmland protection

Farmland protection is a relative broad concept. It involves both quantitative and qualitative protection of farmland by legal, administrative, economic and technical means and measures. China started protecting farmland as early as the beginning of liberation, stressing no occupying farmland for non agricultural land. From the 1960s, China started transforming middle-and-low-yielding fields, established stable high yield fields, and gradually focused

on quality of farmland. From the 1980s, with rapid development of reform and opening-up, and urbanization, the farmland protection entered a new stage in China^[1]. China started to take farmland protection as the core, made extensive researches on theories, operation system and operating mechanism of farmland protection, and has established a basic theory and method system. Basic theoretical researches of farmland protection mainly involve farmland quantity and quality, ecological environment, and relevant scientific theories.

With rapid advance of industrialization and urbanization and population growth, farmland is facing unprecedented pressure and challenge. Farmland protection is receiving wider attention. For this, some scholars have proposed protecting farmland area and preventing further shrinkage of per capita farmland area. In addition, land degradation, such as desertification, salinization, and soil pollution, has resulted in a series of problems, and some scholars contend that quality and quantity management and protection should be balanced^[5]. On the basis of this, some scholars believe that it should also pay attention to economic environment^[6].

With deepening of researches and increasing complexity of farmland protection issue, some scholars have started systematic research on farmland protection, and have established relatively complete theoretical system. Liu Hongzhi *et al.*^[7] summarized theory of farmland protection as theory of system dynamics and theory of sustainable utilization. (i) System dynamics is an analytical approach based on feedback control theory, taking computer simulation technology as major means, and combining qualitative and quantitative analysis methods through building quantitative models, to realize integration of scientific and empirical decision-making; (ii) Sustainable utilization stresses that production conditions and environmental foundation of land resource shall be maintained and improved, at the same time of maximizing benefit of economic development. Gao Wei and Hu Yongjin *et al.*^[8] thought that farmland protection theory also includes following theories: (i) Man-land relationship theory; oriented towards coordi-

nating man-land relationship and constantly satisfying demands of agricultural products for population growth, to control population growth, alleviate pressure of agricultural population on farmland, and benefit properly utilization and development of farmland resource; (ii) Input-output theory: stressing constantly improving farmland productivity relying on increasing input and scientific and technological progress, to mitigate pressure of economic development on farmland; (iii) Externality theory: farmland includes economic output value, social carrying value and ecological service value, thus, apart from economic benefit, it should also attach importance to social and ecological benefits; (iv) Utility theory: it emphasizes scarcity of farmland, and follows the principle of balancing benefit obtained and cost paid, to optimize land use^[7]. Besides, Deng Hang and Yang Zisheng *et al.*^[9] proposed intensive management principle and dynamic balance principle, stressing conservation of land use, to realize maximal benefit and dynamic balance between population, economy and land.

3 Researches on farmland protection system

Farmland protection system is procedure of doing business and code of conduct to be complied with by all people for farmland protection. It confirms farmland protection in the form of system, and everyone must obey and jointly protect farmland. In 1986, promulgation and implementation of *Law of Land Management of the People's Republic of China* and founding of State Bureau of Land Administration mark preliminary establishment of formal system of farmland protection in China. Later, farmland protection system experienced reform and improvement in *Regulations on the Protection of Capital Farmland* in 1994, *Land Use Regulation* in 1997, revision of *Land Management Law* in 1998 and founding of Bureau of State Land Supervision in 2006^[2]. As to establishment of most stringent farmland protection system in China, some scholars believed that it should be the revision of *Land Management Law* implemented on January 1, 1999, because it sets up two policy frames for China's farmland protection: land use regulation system and balance in farmland occupation and supplement^[10]. At present, the frame of China's farmland protection system, with *Land Management Law* (1998) as the core, mainly includes land use regulation, dynamic balance of total farmland area, capital farmland protection, and land tax systems^[3]. Domestic researches on farmland protection system focus on existing problems and system drawbacks.

3.1 Comments on dynamic balance system of total farmland area

Since China implements balance in farmland occupation and supplement, it indeed plays a great role in promoting farmland protection and grain security. However, due to short time of development, its implementation is confronted with many problems, and the effect is not satisfactory^[12]. Lu Haiyang and Li Mingyue summarized drawbacks of the system of balance in farmland occupation and supplement: (i) farmland supplement focuses on reclamation, which is in conflict with ecological restoration of farmland; (ii) farmland occupation and supplement care more about

quantity, but ignore the quality, and there is surplus exaggeration of new farmland area in land development and consolidation; (iii) in the process of system implementation, local difference is not considered, simply considering balance in occupation and supplement is contrary to sustainable development of economy, ecology and society; (4) the system of balance in farmland occupation and supplement is in conflict with developing economy and securing grain^[13]. Huang Jihui *et al.*^[14] analyzed policy effect from balance in total farmland area, quality based quantity balance, and farmland productivity based dynamic balance of total farmland area. They stated that, since the implementation of dynamic balance of total farmland, China has realized the balance in farmland occupation and supplement in quantity. Nevertheless, the quality of supplement is lower, leading to reduction in gross productivity of farmland, insufficient fund input, lack of regulations of farmland restoration, and serious soil pollution.

3.2 Comments on capital farmland protection system In 1992, the State Council approved the *Notice on Comments of Carrying out Capital Farmland Protection in the Whole Country* issued by the former State Bureau of Land Administration and the Ministry of Agriculture, and officially defined concept of capital farmland. In 1998, the revision of *Land Management Law* included the capital farmland protection into legal planning, and took stringent approval system for change of agricultural land use to protect capital farmland. In recent 20 years, the capital farmland protection system has made certain achievement, but it is still to be further improved.

The drawback of this system lies in unclear concept system, lack of operability, focusing on administrative task in division, and lack of scientific demonstration. And there are widespread problems of "dividing distant rather than near area, diving bad rather than good area, and occupying good land but supplementing bad land". Tang Jian believed that farmland protection has following problems: (i) imperfect grading system and backward farmland use planning in protection zone; (ii) farmland monitoring means failing to satisfy demands for change of land use and land quality; (iii) shortage of fund for capital farmland protection; (iv) defect in assessment system of local government performance and not adequate capital farmland protection means; (v) imperfect protection mechanism, and system of land supplement from other place and land protection by other place^[15]. Chen Meiqiu stated that: (i) capital farmland protection lacks real executive subject, and it is difficult to determine the real protector of capital farmland protection among farmers, villager collective and local government; (ii) opportunity cost brought by capital farmland protection fails to be shared properly, so user of capital farmland and the development right given up by the owner receive no adequate compensation; (iii) planning of capital farmland protection is not scientific and occupation and supplement are not put in place^[16].

3.3 Comments on land use regulation system Currently, the land use regulation system mainly has following problems: (i)

from the perspective of management; management mechanism is defective, which is characterized by vacancy in approval exemption and rejection mechanism, and complicated administrative examination and approval procedure; it focuses on regulation over transfer of agricultural land to other purposes, leading to drawback in regulation content; land use regulation at all levels lacks overall planning and coordination, so the management system is in disorder; legal protection mechanism is not well established, and it lacks legal basis; information means is backward^[19]; (ii) from the perspective of legal act and system, imperfect laws and regulations in the practice of land use regulation lead to low efficiency of regulation, or negligence of regulation, consequently leading to inadequate judicial remedy^[17]; (iii) from the perspective of system implementation, the obstacles to implementation of land use regulation mainly include backward information and compilation means, disconnected administration and judicial system in responsibility investigation mechanism, and imperfect planning and management mechanism, leading to ineffective implementation and low regulation efficiency^[18].

In addition, land development, consolidation and reclamation system is also one of issues in the study of farmland protection system. Since the Ministry of Land and Natural Resources assigned first land consolidation project in 2001, land consolidation and reclamation have been launched in a wide range, and have made significant achievement, but also revealed many problems. Some scholars summed up following problems: (i) after development and consolidation, the land quality is still very low, so it fails to realize real balance of occupation and supplement; the development and consolidation are seeking short-term local interests at the sacrifice of long-term overall interests; laws and regulations relevant to development and consolidation are not perfect, and there is no clear and stable property system; the cost input is high, while management lags behind^[20]; (ii) Supporting laws and regulations are not well established, supervision and guidance of land consolidation are not adequate, planning system is not perfect and fund input is insufficient^[21]; (iii) objective of land consolidation is simple and neglects ecological protection; planning fails to consider local situations and there is problem of blind development; system construction is to be improved^[22].

4 Researches on factors influencing farmland protection

Since 1996, China's farmland protection has received unprecedented attention. Researches on farmland protection also take on various aspects. However, farmland fails to get effective protection. As to reasons, different scholars have different opinions. But it is agreed that reasons mainly include subjective and objective factors.

4.1 Subjective factors

(1) Cognition factor: backward idea and inadequate cognition. At present, only academic circle and relevant administrative departments have realized importance of farmland protection,

while most people are not aware of its urgency, let alone know farmland protection is a fundamental state policy, like family planning and environmental protection^[23]. Both government and farmers pay little attention to farmland, especially farmland quality, and the strategic idea is not definite^[24]. Besides, cities expand blindly, farmland protection awareness is weak, and understanding of the relationship between farmland protection and economic development is not clear^[25]; some local government just thinks of immediate interests, but does not attach importance to farmland protection^[26].

(2) Management factor: ineffective implementation of farmland protection policies and land laws and regulations. Local government purchases land at low prices and sells at high price, and merely seeks economic benefits. Different industrial sectors have different requirements for land use structure and distribution. As a result, it is difficult to implement farmland protection policies^[28]; there are problems of "dividing distant rather than near area, dividing bad rather than good land, and occupying good land but supplementing bad land". The dynamic balance of total farmland area and "occupying one parcel of land and supplementing one parcel of land" fail to stop drop in farmland quality^[35]. At level of laws and regulations, China has formulated and promulgated a series of policies and regulations on farmland protection, but there are problems of failure to observe laws, not strict in enforcing laws and refraining from punishing law breakers^[33]. These problems connive at law breakers. Thus, backward construction for land laws is internal cause for reduction of farmland^[23].

(3) System factor: land property system is unreasonable. Existing urban land property structure and property relationship are unreasonable, and property subject of rural collective land is not definite. These are mainly characterized by: (i) ownership subject of collective land is not definite, farmland protection has no implementation subject, and uncertain property reduces farmers' confidence in farmland, and the desire for farmland protection is not strong^[34]. (ii) China's rural land collective ownership has drawbacks of lack of clear rural land contractual management, lack of exclusiveness and safety. What's worse, the definition of public interest in existing land property system is also not perfect.

(4) Act factor: weak act of government, social organizations and farmers in farmland protection. Local government fails to set up scientific outlook on development and accurate performance outlook, but just blindly pursues rapid economic growth, and energetically develops non-agricultural industries and occupies farmland^[43]. In the process of obtaining land use right, social organizations do not distinguish difference between good and bad land, and between mountain and plain areas. Land users simply take advantage of level and convenient farmland surrounding cities, leading to occupation of much fertile farmland^[45]. Besides, township enterprises are in full flourish, separately distributed, so the intensive use of land is low. And small mines and brick kilns bring a lot of waste farmland, leading to serious waste of farmland re-

source^[43]. With increase of farmers' income, "house building hot" and "tomb building hot" occur, and there are more and more hollow villages; multiple source of income and increase in income gradually weaken the guarantee function of farmland on farmers' living^[45].

4.2 Objective factors

(1) Economic factor. (a) Insufficient agricultural input. Insufficient agricultural input and low efficiency will generally lead to drop of farmland quality^[35]. In recent years, "occupying good land but supplementing bad land" also accelerates reduction of farmland quality, and decrease in agricultural infrastructure investment is also one of major reasons for drop of farmland quality^[33]. Furthermore, insufficient input of government in farmland protection and improvement also promotes drop of farmland quality^[24]. (b) Low agricultural benefit gives rise to agricultural structural adjustment. One of reasons for shrinkage of farmland in China is agricultural structural adjustment^[25]. Relevant data indicate that farmland reduces for 139.4×10^4 hm² due to agricultural structural adjustment. In addition, agricultural products remain at low price, leading to slow increase in farmers' income and farmers are unwilling to plant grain. As a result, much farmland is changed into orchard or tea garden, consequently leading to reduction of farmland. (c) Nonagricultural construction occupies farmland. This is manifested in three aspects: firstly, increase in urban land use and urban expansion occupying much farmland. In future 50 years, about 500 million rural surplus labors and their family members will go to cities, which needs construction of a lot of new cities or expansion of many existing cities^[30]. Secondly, construction of various development zones occupies much farmland. Thirdly, construction of green belt (mainly in cities and along main traffic lines) occupies much farmland because most of area around cities and main traffic lines is quality farmland^[29].

(2) Environmental factor: ecological restoration. Vulnerable ecological environment and deteriorating ecological environment resulted from excessive reclamation, overgrazing, and misuse of water resource force us to concede the land to forestry from the perspective of sustainable development. Among factors influencing quantity of farmland, conceding farmland to forestry has become the major one^[39].

(3) Scientific and technological factor. Advanced agricultural production technologies can reduce unit production cost, increase yield and improve quality of agricultural products, and increase farmers' economic benefits, so as to make farmers settle down in agricultural production, thus fully utilize and protect farmland. Nevertheless, the support for farmland protection is still not enough.

5 Researches on methods and measures for farmland protection

5.1 Heightening awareness of farmland protection in cognition Strengthening propaganda of farmland protection is an important method to heighten awareness of farmland protection. Fan

Quanxian *et al.* recommended strengthening propaganda and education of farmland protection through taking advantage of radio, television, newspapers, and posters, to make farmland protection rooted in hearts of the people^[26]. Chen Guishen *et al.* believed that in the whole society, especially in national land system, it is required to enhance series of training and propaganda on farmland protection, to heighten the awareness of farmland protection, and make the farmland protection run through every link of land management^[25]. At the same time, it should set up the national land awareness of "large population but little land and shortage of resources", to reinforce awareness of farmland protection.

5.2 Constantly improving existing farmland protection systems and policies It is recommended to do well in construction of policies and regulations, and formulate farmland protection regulations by sectors and types^[43]. Central and local land policies should be coordinated, strictly define land management space of local government and function scope of farmland protection, make clear labor division of government and land management departments at all levels, establish open and transparent land market, and strictly implement land bid invitation, auction and listing system, to avoid rent-seeking action^[5].

5.3 Enhancing supervision to optimize law enforcing effect

Firstly, it should reinforce prevention, supervision, investigation and prosecution of law breaking in land, and establish scientific performance criteria, assessment system and supervision system. Secondly, it should enhance macro regulation of national land^[44], try to abrogate right of local government to dispose state-owned land assets to obtain benefits. The state should take back land management right of city, prefecture and county government. Local government should take tenure, inheritance, transfer and appreciation of expropriated land as major source of financial revenue, and completely eliminate the phenomenon of local government selling land to supplement financial revenue^[37]. Besides, it should implement the farmland protection target responsibility system, assess performance of local government in farmland protection, periodically inspect farmland protection^[25], and increase the punishment of law breaking. For law breaking action in land, it is required to promptly find, stop and punish^[5].

5.4 Constantly making technological innovation, increasing agricultural fund input, and expanding fields of support for agriculture In technology, it is proposed to explore existing successful experience and apply it into actual farmland protection, and extend scientific and technological achievement relevant to water loss and soil erosion, desertification, salinization and pollution prevention, application of organic fertilizer and formula fertilizer in wider areas^[23]. Advanced remote sensing and computer technology, for example, 3S technology, can be used as scientific means for farmland resource survey and dynamic monitoring, to realize modern farmland protection and management. Meanwhile, energetic effort should be made to study and extend advanced agricultural production technology and farmland disaster prevention technology, such as soil improvement, desertification control, fine

seed trial production, scientific selection of application of fertilizer, and use of proper farming method, to increase farmland productivity and protect farmland^[43]. Besides, it should increase fund input into rural infrastructure. Combining the reform of rural land use right system, it is recommended to encourage enterprises and farmers to carry out large-scale operation of land, increase fund input into farmland with integration of utilization and protection^[43]. Furthermore, it should increase agricultural input to strengthen transformation of middle-and-low-yielding fields^[40].

5.5 Principles and methods of farmland protection

(1) Both farmland protection and economic development are important, especially at the present stage of rapid economic development, with acceleration of industrialization and urbanization, moderate occupation of some farmland is inevitable. However, it should properly treat the relationship between farmland protection and economic construction. On the precondition that development is of overriding importance, farmland should be protected, and economic development should not be influenced^[38]. In this situation, the most effective method for farmland protection is bringing benefit, and ensuring dynamic balance of total farmland area with benefit.

(2) Farmland protection should maintain consistency with policy selection. In view of the conflict between urbanization and farmland protection, it should further improve land market, push forward intensive land use, bring into full play positive role of urbanization to farmland protection, and find out the balance point between ecological protection and farmland protection^[44].

(3) In the process of farmland protection, it should combine key protection and general protection. For example, protect high quality and high yield farmland, such as capital farmland, urban vegetable production base, agricultural scientific research, and teaching experimental plot. Also, it should combine static protection and dynamic protection, and set up "big protection" concept of farmland protection^[6]. Besides, it should increase effective supply of farmland through strengthening land development, consolidation and reclamation, and explore potential road to realize dynamic balance of total farmland area^[41].

(4) It should bring into play fundamental allocation function of market mechanism in farmland protection, to realize rational allocation of fund, labor and farmland in the whole country^[42], and realize dynamic protection of farmland resource.

(5) It should combine farmland protection and farmers' income, to encourage participation of the whole society. Therefore, when making farmland protection policies, it should stand strategic height and have long-term view, do not protect just for protection. Instead, it should coordinate the relationship between farmland protection and agricultural structural adjustment, and agricultural industrialization management^[12].

6 Conclusions

As irreplaceable natural resource, farmland concerns sustainable development and long-term stability of a country or region. China

is large in population and little in land, it feeds 22% of world population with only 7% of the world farmland, so the human-land conflict. Therefore, strictly protecting farmland and realizing reasonable and sustainable use of farmland have become an inevitable choice for grain security and social stability. Due to distinct regional disparity, at the same time of holding 120 million hectares of arable land red line, it is required to explore how to flexibly use land in accordance with local situations, increase land use efficiency, and coordinate the relationship between food and construction, to guarantee sustainable and stable development of economy. In several decades of farmland protection theory, method research and protection practice, China has established an effective farmland protection method and system, and has made considerable achievement in farmland protection. Nevertheless, there is still no land evaluation system suitable for characteristics of farmland protection in China, and the protection theory and method researches are still to be further deepened, and technical support system needs enhancement. In addition, scientific and operational characteristics of farmland protection planning system are to be supplemented; laws and regulations on farmland protection need improvement; enforcement of laws and regulation on farmland protection needs enhancement. According to present economic development trend of China, it is easy to see that China's farmland protection is very difficult, the task is arduous and the responsibility is weighty. In future, from points of view of land policy, tax and planning, it should set up farmland protection law and regulation guarantee system with scientific farmland use change restriction and regulation system as the core, and establish farmland protection scientific support system with conserved and intensive use of land as key point, to ensure reasonable use and protection of precious farmland resource under the general objective of stable and sustainable social and economic development, and implement fundamental state policy of "rationally utilizing and steadily protecting each inch of farmland".

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