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Establishment of a Novel Agricultural Science and Technology Service System in Beijing

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Abstract Guiding ideology and objective of a novel agricultural science and technology service system in Beijing are introduced based on the development status of agricultural science and technology service system in Beijing. Then, the six components of a novel agricultural science and technology service system in Beijing are analyzed, which are government department system, public welfare extension agency system for agricultural technology, agrotechnical extension agent system at village level, scientific research institution system, rural economic cooperative system, and agriculture-related enterprise system. And the three transmission routes of agricultural science and technology service are also put forward, such as public welfare service route of agricultural science and technology, operating service route of agricultural science and technology, and supporting route of agricultural science and technology. Among them, operating service route can be divided into government-guided industrialization transmission route and market-oriented technology transmission route. Finally, concrete ideas for establishing the novel agricultural science and technology service system in Beijing are discussed from four aspects, including mechanism construction, capable people team construction, institution and organization construction, and support safeguard.

Key words Beijing, China; A novel science and technology service; System construction; Extension organization

Agricultural science and technology service system is an important component of agricultural social service system, as well as an important vector of agricultural science and technology dissemination. Since the 1950s, Beijing has established a number of agricultural science and technology service systems mainly involving agriculture, forestry, animal husbandry, water conservancy, meteorology and so on, which play an important role in the extension of a novel technologies and new varieties, the control of animal and plant diseases, the guarantee of agricultural products safety, the improvement of ecological environment in urban and rural areas, the construction of water conservancy, and the enhancement of peasants' quality. However, with the deepening of the household contract responsibility system, the existing agricultural science and technology service system has various problems, affecting the exertion of science and technology promotion and service functions. With the acceleration of metropolitan modern agriculture in Beijing, agriculture has developed from the stage of infrastructure construction to industrial upgrading and in-depth development. And it becomes urgent to speed up the reform of modern agricultural science and technology service system and to establish a novel agricultural science and technology service system.

Based on further understanding of the spirit of 2009 No. 1 Document, the Third Plenary Session of the Party's 17th Central Committee, and the *Opinions on Accelerating the Reform and Construction of Township or Regional Agricultural Extension Agencies* by the Ministry of Agriculture, the basic route to construct a novel agricultural science and technology service

system is put forward combining with the actual construction situation of agricultural science and technology service system in Beijing.

1 Guiding ideology and construction objective

1.1 Guiding ideology Under the guidance of the spirits of the 17th National Congress of CPC, the Third Plenary Session of the Party's 17th Central Committee, and the Fourth Plenary Session of the Party's 17th Central Committee, we should adhere to the guidance and lead of government based on the scientific development view, according to the basic requirement of the integrated new pattern of urban and rural economic and social development and the construction objective of "Humanistic Beijing, Science & Technology Beijing, Green Beijing". Meanwhile, we should also serve the farmer and agriculture around the main line of increasing the income of agriculture and farmers, give full play to capital, talent, technology, marketing, management and service advantages of Beijing, establish and improve metropolitan modern agricultural science and technology service system with supporting facilities, convenient and efficient characteristics covering the whole range of Beijing, and to promote the rapid economic and social development of Beijing.

1.2 Construction objective According to the strategic requirement of the integration of urban and rural economic and social development, Beijing tries to be the first to establish a diversified agricultural science and technology service system in China within 2 or 3 years by using a series of measures. This is led by government agricultural extension agencies for public welfare based on rural economic cooperative organizations with a wide participation of agricultural research or education institutions and agriculture-related enterprises. Ultimately, the integra-

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tion of agriculture, science and education can be realized, as well as the high quality of service team, the rationalization of system construction, and the diversity of guarantee measures^[1].

2 Basic framework of a novel agricultural science and technology service system in Beijing

A novel agricultural science and technology service system refers to a integrated system different from traditional agricultural technology extension system and suitable for the development requirements of modern agriculture and rural economy with technology service as the main line. Its subsystems or elements are various organizational forms or patterns of technology services with agricultural industrialization as the objective, offering service for the full process of production.

2.1 Structure of agricultural science and technology service system According to the extension organization, a novel agricultural science and technology service system in Beijing should include six subsystems, which complement, interact and promote each other and together constitute a new science and technology service system of metropolitan modern agriculture in Beijing (Fig. 1).

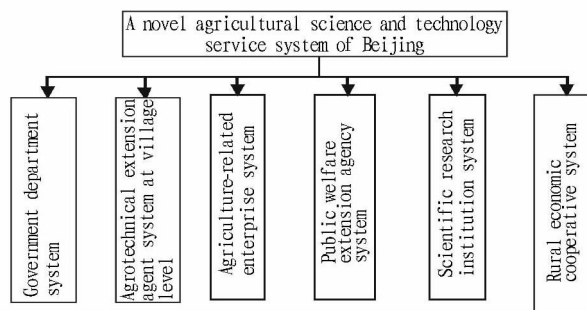


Fig. 1 Basic framework of a novel agricultural science and technology service system in Beijing

2.1.1 Government department system. This system is an important defender during the effective operation of agricultural science and technology service system, which belongs to the superstructure and coordinates the entire operation of agricultural technology extension system^[2]. It is a unified system under the leadership of municipal government and municipal party committee of Beijing with cooperation of many departments, such as agriculture, science and technology, finance, taxation, business and education. Whether the government department system can play an effective role or not is determined by the high attention and strong leadership of municipal government and municipal party committee, as well as the clear division of responsibilities for relevant departments and the effective coordination and cooperation mechanisms. Besides, the main way to exercise government function is no longer confined to direct participation in agricultural science and technology service through setting up specific promotional service agencies. More importantly, law, economy, finance, administration and other regulatory measures are comprehensively used to create a good development environment, to guide the exertion of promo-

tional theme, to promote the optimal allocation of resources, and to ensure the effective functioning of the whole system. Apparently, the "visible hand" of government also affects this system directly at different stages under different situations, in order to compensate for the absence of "invisible hand" of market in the field of public goods or services.

2.1.2 Public welfare extension agency system for agricultural technology. The system involves agricultural technical service departments or organizations at municipal, district (county) and township levels and plays a leading role in a novel agricultural science and technology service system. The component subject is not only a main provider of public welfare technology service but also a bridge or link between government departments and peasants. In science and technology service system, government agricultural extension agent is mainly responsible for promoting public welfare services, such as the introduction, examination and demonstration of key technologies, the monitoring, prediction, prevention and treatment of crop pests, animal diseases and agricultural disaster, the utilization of agricultural resources and agricultural inputs, the monitoring of agro-ecological environment, the detection and compulsory inspection of agricultural byproducts quality safety, the water resource management and flood and drought control, and the services for public information in rural areas and peasants training and education.

2.1.3 Agrotechnical extension agent system at village level. It is mainly composed of local expert, demonstration household, rural broker, able person and technology coordinator. These people not only have a certain mass basis but also have many years' experiences of front-line agricultural extension, bearing the important task of disseminating agricultural science and technology to peasant households and directly promoting the development of agricultural production and rural economy. The key to solve the problem of service vacancy at village level is to perfect this subsystem, which extends the tentacles of science and technology, activates the branch of promotion, improves the network of agricultural technology extension, and has laid a solid foundation for the development of metropolitan modern agriculture.

2.1.4 Scientific research institution system. This system involves agricultural research institutions, colleges and universities, and education and training institutions in Beijing, which have rich resources, are important suppliers of agricultural science and technology achievements and talents, as well as the effective strength of agricultural science and technology service, and play an important role in enhancing the level and quality of agricultural science and technology service. This system is mainly composed of different government departments, which accept the guidance of government departments, and undertake the task of offering technical services to peasants household and technician in agriculture. They may also carry out various types of agricultural science and technology service activities when collaborating with other technical service system.

2.1.5 Rural economic cooperative system. Rural economic cooperative organization is formed by various types of novel ru-

ral cooperative organizations based on their own interests and voluntary combination. Behavior subjects in this organization are under no administrative control. For instance, relationship between peasant and professional cooperation organization and between different professional cooperation organizations is created based on their own interests demands. Therefore, this system is rooted in peasants, can most truly represent the backbone elements of the interests of peasants and is an irreplaceable part of a novel system.

2.1.6 Agriculture-related enterprise system. This system involves various agricultural industrialization leading enterprises, science and technology parks, demonstration bases and intermediary service enterprises. Enterprise is the most dynamic cell of market economy, and the final vector of economic activity benefits. Enterprise is most close to the market, feeding back market information on time to rural economic cooperative organization, encourage and help them to adopt the most appropriate technology and to produce the best products to meet market demand. Meanwhile, compared with scattered rural households, enterprise is more commitment to a variety of market and technological risks, and is the main user, early adopter and excellent demonstrator of new technologies. Thus, this system plays a fundamental role in the a novel agricultural service system.

2.2 Transmission route of agricultural science and technology At present, main bodies of agricultural science and technology service cooperate with each other and a variety of science and technology service modes are formed, mainly including one supporting route of agricultural science and technology and two service routes of agricultural science and technology (Fig.2).

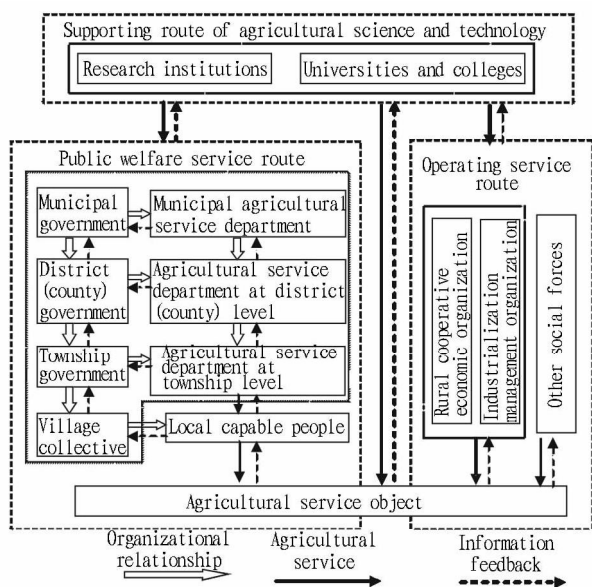


Fig.2 Metropolitan modern agricultural science and technology service route in Beijing

2.2.1 Public welfare service route of agricultural science and technology. Most of the agricultural scientific and technological achievements have a certain nature of public goods. Because

of the problem of " market ineffectiveness" , pure public goods must be supplied without compensation by government. There are two kinds of public welfare service route of agricultural science and technology. One is direct supply of government through relevant departments or organizations, the other is fund allocated by government in the form of open tender, produced and supplied by the research departments, enterprises and other non-governmental organizations. The most prominent characteristics of public welfare agricultural science and technology service is the guidance of the will the state, which promotes the cooperation among departments and main bodies, maximizes the spread of scientific and technological achievements, and affects the overall situation of the whole region. It is a top-down and supply-leading strategy relying on macro-control and administrative orders.

2.2.2 Operating service route of agricultural science and technology. On the one hand, associations and industrialization organizations extend advanced scientific and technological achievements to peasants through demonstration base, demonstration garden, demonstration household, and technical training. On the other hand, agricultural service objects feed back the science and technology needs to relevant government departments or research institutes through the above mentioned organizations. Thus, a benign interaction and feedback mechanism is formed. Associations, leading enterprises and cooperative organizations have given full play to the advantages of network and communication, and have established a market-oriented agricultural science and technology social service system adapting to the demands of specialization, regionalization and industrialization. In this operating service route, governmental authorities play the functions of macro control, service purchase and guidance. According to the functions of government, this type of agricultural science and technology service can be divided into government-guided industrialization transmission mode and market-oriented technology transmission mode.

(1) Government-guided operating transmission mode mainly includes the promotion modes of " public welfare agricultural science and technology extension agent + joint-stock cooperative" , " public welfare agricultural science and technology extension agent + agricultural trade association" , " public welfare agricultural science and technology extension agent + agriculture-related enterprise" , " public welfare agricultural science and technology extension agent + agricultural science and technology park" and so on. This mode can effectively solve the contradiction between the lack of grass-roots agricultural extension forces and the scientific and technological demands of peasants.

(2) Market-oriented technology transmission mode is an agricultural extension service network mode dominated by private research institution. Private research institution, scientific and technological enterprise, and technology intermediary service organization use their scientific research findings or scientific achievements provided by the government to conduct a second research and development, so as to form their own technology products, to promote to peasants or rural enterprises by the

way of compensable transfer through market transaction, to directly transfer into productivity through science and technology industrialization, and to form a second network for agricultural science and technology extension service. This mode is ideal for the Beijing region which has better economic condition, convenient transportation, rapid transmission of information, and strong scientific and technological awareness of peasants.

2. 2.3 Supporting route of agricultural science and technology. During the industrialization transmission of agricultural science and technology service, research institutions undertake the supporting role for scientific and technological innovation and service. Agricultural research institutions promote the public welfare agricultural scientific and technological achievements to industry associations, enterprises, cooperative organizations and other social service providers by means of compensation, or for free. While the technological demands of agricultural service object are fulfilled through the practice of research institutions and the feedback of agricultural service organizations and public welfare extension agencies.

3 Main content of constructing a novel agricultural science and technology service system in Beijing

3.1 Construction of institutions and organizations

3.1.1 Promoting the reform of government agricultural extension agents. According to the requirements of the metropolitan modern agriculture, public welfare responsibilities of city, district (county) and township levels should be further refined in order to achieve a simplifying organization, clear responsibility and transparent procedure^[3]. Based on the existing agricultural service center, integrated agriculture service center at township level (cross region) is reformed and improved, which is managed by agricultural departments at district (county) level. According to the demands of rural industry and local peasants, agricultural social service site at village level is established and is managed and guided by the integrated agriculture service center at township level (cross region).

3.1.2 Encouraging scientific and technological cooperation between scientific research institutions and districts (counties). Agricultural universities and research institutions are encouraged to participate in agricultural service extension, to explore the optimal organic combination of scientific research, education and extension through the means of project support and interests binding. Meanwhile, "Cooperation and Promotion Method in Beijing" should be issued in order to make clear the status, role and function of universities, colleges and research institutions in local economic development, and to allocate special funds for extension. Universities, colleges and research institutions should take serve of agricultural technology as an important indicator in agricultural personnel evaluation system, so as to create new ways and means of service and to improve the transformation rate of scientific research.

3.1.3 Supporting the rural economic cooperative organization. In order to solve the problems of large amount, small scale and low quality of rural specialized cooperatives in some

districts (counties), relevant departments should define the establishment standards of cooperative organizations, strictly implement access system, and help to establish sound and scientific management mechanism, benefit distribution mechanism and internal management rules according to the development principles. Government should give key support and reward to rural organizations which are able to expand marketing channels, have organization, operation and management capacities, or are engaged in agricultural infrastructure construction and agricultural products deep processing project, as well as the rural specialized cooperative economic organizations with larger scale, cross-regional alliance, relatively standard operation and wider influence.

3.1.4 Guiding and strengthening the leading enterprises. Create conditions for the docking of agricultural enterprises and scientific research institutions; help leading enterprises to introduce advanced scientific and technological achievements; augment funds to support agriculture and scientific and technological projects in leading enterprises; encourage leading enterprises to open sales center and to set up sales window in other cities, provinces and countries for famous brand products; build distribution center, chain operation and other circulation services; and cultivate a group of leading enterprises, intermediary service organizations and agricultural products logistics bases with strong marketing abilities in order to promote the marketing of agricultural products.

3.1.5 Enhancing the innovative capability of agricultural science and technology park. Under the condition of equal competition, agricultural science and technology parks have the priority to extend the major agricultural science and technology projects of Beijing. Introduction, digestion, absorption and innovation of high and new technology in agricultural science and technology parks are supported by relevant departments. Thus, these parks may lead the agricultural high-tech industrialization in Beijing and may become the demonstration bases that help peasants to grasp modern agricultural technology and lead peasants to get rich. Domestic high-tech enterprises in parks may enjoy relevant preferential policies after the approval of competent science and technology authorities in Beijing. Technological achievements and products in parks with certain capacity to earn foreign exchange are given the priority to obtain the foreign trade import and export authority. Enterprises, colleges and universities, and research institutions in parks are encouraged to establish a relationship of scientific and technological cooperation, and go along the road of production teaching research integration pattern, so as to make agricultural science and technology park become a real incubator for the transformation from agricultural high-tech to productivity.

3.2 Construction of capable people team

3.2.1 Stabilizing the grassroots agricultural extension team. Stabilize the public welfare agricultural service team and improve the welfare of grass-roots professionals according to the wage standards of civil servant at the same level. Make sure that the number of rural agricultural service personnel in the front line is no less than 2/3 of the overall staffing in the coun-

ty, and the professional agricultural personnel is more than 80% of the overall staffing. To achieve this, firstly, according to the scales and needs of special industries and leading industries in districts (counties), organizations and personnel posts should be reinstalled. Secondly, reform appraisal methods; adhere to an open, fair and just principles; and adopt the competitive employment mode. Thirdly, standardize the management approach including comprehensive evaluation, performance praise and bonus-penalty system in order to fully mobilize the enthusiasm of grass-roots agricultural workers.

3.2.2 Setting up the post of science and technology extension agent at village level. Under the guidance of township-level (inter-regional) integrated agricultural service center, relying on peasant field school and peasant specialized cooperatives, a group of excellent big specialized households, science and technology demonstration households, and college-graduate village officials are recruited as the "technology extension agents at village level". In principle, each village may set 1 or 2 agents responsible for the extension of new variety and new technology, plant and animal epidemic surveillance, agricultural machinery management, agricultural information transfer and so on. A direct docking extension team for peasants should be established, which assumes the technology extension, materialized service, information delivery, policy propaganda and other auxiliary works for public welfare service organizations. The extension team will gradually become a village service site for the achievement transformation of metropolitan modern agricultural science and technology. Moreover, municipal finance should buy the service and the funds needed should be included in government financial budgets.

3.2.3 Improving the quality of agricultural extension personnel. Start up the "Knowledge Renewal Project for Grass-roots Agricultural Technicians" in an all round way; complete the training for grass-roots agricultural technicians within three years; develop training programs for agricultural technicians and set up special funds; explore a long-term training mechanism by combining the practical skills training from time to time with long-term comprehensive quality training. At the same time, establish special funds for extension training and include them into financial budgets at all levels; certain percentage of annual budget in city (county) finance (5% – 10%) can be used to update the knowledge of agricultural extension personnel; "Knowledge Renewal Project" for grass-roots agricultural technicians should combine with the "licensed technician" system in order to gradually improve the overall quality of agricultural extension personnel.

3.2.4 Enhancing the development of local capable people. We suggest that relevant department should introduce policies to guide the college-graduate village official to work in the cooperative organization, offer certain wage subsidies to college-graduate village official after three years' work, and fundamentally improve the management level and service capability of cooperatives. Meanwhile, increase scientific and technological input in local capable people; establish local capable people bank and reward system; develop evaluation of professional title in

rural areas; offer necessary experimental base and extension base for agricultural technology; pay attention to the leading role of prominent capable people; offer a certain amount of subsidy for peasants engaged in agricultural extension services; give full play to the role of rural vocational school, agricultural broadcasting and television school, peasants technical school, peasant evening school and other educational institutions; use spare time to carry out technical training in order to lay a solid foundation for the comprehensive improvement of peasants' scientific and cultural quality.

3.3 Construction of system and mechanism

3.3.1 Defining clear function and setting reasonable personnel post. Agricultural extension institutions at county and village levels should focus on the work of information service and technology demonstration, and those above county level should pay attention to the system construction and team management. Extension institutions at municipal level should focus on the personnel training and extension institution guidance at city and district (county) levels, strengthen cooperation with large-scale agribusiness and scientific research and teaching departments, and pay attention to the exchange of testing, technology and information. Extension institutions at district (county) level should pay attention to the introduction, test and demonstration of new technologies and the control and monitoring of diseases and pests. Extension institutions at township level should focus on disease prevention and control, technology extension, peasant education and technology consultation.

Public welfare position and its number should be re-determined within the total number of posts. According to the arable land area, multiple cropping index, production scale, households number, service scope, service content and covering objects, compilation departments at the same level should determine the corresponding positions together with agricultural administrative departments at the same level and higher agricultural extension departments.

3.3.2 Separating public welfare from management function. Firstly, separate operating services from the agricultural extension institutions; establish enterprise legal person with share holding; carry out the corporative operation model and share holding management; and effectively solve the problem of unspecified management responsibility. Secondly, separate the management system. Nonprofit agricultural extension department and joint-stock company are two different independent corporate organizations, which have no organizational affiliation or management and legal relationship. Thus, nonprofit agricultural extension institutions should be regarded as state institutions, only responsible for public welfare extension; and government should offer their expenses during work. And operating business for peasants can be handed out to agricultural related enterprises, rural economic cooperative organizations and other extension departments; income from services may pay the wage of non-public service staff and various kinds of insurance should also be paid according to relevant local regulations.

3.3.3 Implementing professional qualification system. According to the *Interim Procedure of Professional Qualifications*

System by the Ministry of Personnel, licensing system should be fully implemented among the people engaged in public-welfare and operational positions in Beijing. Personnel served in public welfare agricultural extension services must obtain the relevant professional qualification certificates, and must be registered. Strict professional qualification system can lay off the unqualified personnel in agricultural extension institutions, so as to improve the efficiency of agricultural extension. In addition, a strict examination system can ensure the basic knowledge and skill of public welfare extension staff, and disseminate the latest agricultural technologies to farmers on time.

3.3.4 Separating evaluation system from employment system. Evaluation-employment separation system for capable people must be established based on competitive employment and two-way selection. We should break the professional rank lifelong system, abolish the connection between professional title and wage, gradually establish a reward distribution mechanism according to posts and performances, achieve the flexible management of staff position and treatment, and solve the existing problems in professional rank lifelong system.

3.5 Support and safeguard

3.5.1 Strengthening the main channel of financial investment.

Table 1 Financial input in agricultural technology extension in China

Year	Total financial investment in agricultural technology extension // $\times 10^8$ yuan	Financial investment intensity of agricultural technology extension // %	Proportion of agricultural technology extension investment in finance expenditure supporting agriculture // %	Annual growth rate of financial investment in agricultural technology extension // %
2000	75.5	0.51	9.7	7.14
2001	85.0	0.55	10.3	12.58
2002	95.0	0.58	9.9	11.76
2003	107.0	0.61	9.1	12.63

Note: Data are from references [4].

3.5.2 Strengthening financial supervision and audit. The reasons for the shortage of grassroots agricultural extension funds are the absolute shortage of funds and the misappropriation of funds. Therefore, when increasing funds, government should strengthen the financial monitoring and auditing of agricultural extension expenses at all levels, and ensure the rational use and full quota of funds. Financial departments should manage the funds and directly allocate them to research institutions, colleges and universities, and peasants cooperative organizations according to the proportion of tasks in order to avoid administrative intervention and capital loss^[5].

3.5.3 Improving the infrastructure of agricultural extension agency. Infrastructure of township-level (inter-regional) agricultural integrated service center should be improved, such as setting up training room of peasants field school and agricultural products rapid-test room. We should support the establishment of township-level (inter-regional) agricultural integrated service center above 6.67 hectares, and develop it into demonstration base for new varieties and new technologies, training base for agricultural technicians and peasants, and innovation base for college students. Meanwhile, scientific and technological achievements hatching platform and generic technology research and development platform should be established to support co-

operative innovation and to realize resource sharing and information building.

Government investment in agricultural extension institutions should ensure the clear channel, reasonable budget, incremental guarantee and timely payment. This investment mainly includes personnel expenditure (wage, benefits, labor insurance and so on), agricultural special funds, and the funds to carry out public welfare functions (business funds, training costs, facilities and equipment costs and renewal expenditures). At present, financial investment in agricultural technology extension has been raised in China with a steady increase in investment intensity but it is still far below the average level of industrialized countries (Table 1). In the year 2002, investment intensity of agricultural extension in Beijing is 0.18%, which is far lower than the 0.58% average level at the same time. Therefore, we suggest that government in Beijing should increase the annual extension funds to more than 0.5% agricultural GDP. With the development of agricultural economy, total funds should also be increased simultaneously. Meanwhile, we should increase the capital investment in public welfare agricultural technology extension projects, enlarge the project coverage, extend project implementation period, and give full play to public welfare function of technology extension agencies.

operative innovation and to realize resource sharing and information building.

4 Conclusion

Science and technology service system in rural areas is an important pillar of agricultural scientific and technological progress, as well as the basic security of agricultural industrialization and modernization^[5]. Research result in this paper is of certain reference significance to the construction of a novel agricultural science and technology service system. However, there are still some issues left to be further studied.

References

- [1] ZHOU T, ZHANG GL, CHEN LY. Problems and countermeasures of the service system construction of agricultural science and technology in Beijing[J]. Journal of Anhui Agricultural Sciences, 2008, 36(36): 16218-16219, 16256. (in Chinese).
- [2] ZHANG LX, JI HY. Study on Chinese governmental investment in agriculture technology extension[J]. Problems of Agricultural Economy, 2007(2):55-62. (in Chinese).
- [3] KONG XZ, XU ZY, SHI BQ. Research on the status quo, problems and countermeasures of China's agricultural socialized service system currently[J]. Jiangnan Tribune, 2009(5):13-18. (in Chinese).

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- use—a case study in Zhejiang Province[J]. Resource Development & Market, 2005, 21(5):412–415. (in Chinese).
- [10] Statistics Bureau of Zhejiang Province. Zhejiang statistical yearbook [M]. Beijing: China Statistics Press, 2007. (in Chinese).
- [11] The National Bureau of Statistics. China statistical yearbook [M]. Beijing: China Statistics Press, 2007. (in Chinese).
- [12] XU JH. Mathematical methods in contemporary geography [M]. Beijing: Higher Education Press, 2002:47–60. (in Chinese).
- [13] ZHAO PD. Quantitative geoscience methods and its application [M]. Beijing: Higher Education Press, 2004:30–67. (in Chinese).
- [14] CHEN BT. Soil geography and biogeography [M]. Shanghai: East China Normal University Press, 1991:178–182. (in Chinese).
- [15] LU W, WANG YB. Using the logistic map to describe ecological balance[J]. Journal of Anqing Teachers College: Natural Science, 2003, 9(1):53–55. (in Chinese).
- [16] XIA SF, XU HW, WANG K, *et al.* Study of the driving forces of cultivated land use change in Zhejiang Province [J]. Bulletin of Science and Technology, 2006, 22(3):345–351. (in Chinese).
- [17] CAI YL, HUO YQ. Reevaluating cultivated land in China: method and case studies [J]. Acta Geographica Sinica, 2006, 61(10):1084–1092. (in Chinese).
- [18] MAO XJ, CHEN LJ, SUN H, *et al.* Study on the driving factors of the cultivated land spatio-temporal change and protection strategy for cultivated land in Zhejiang [J]. Journal of Zhejiang Normal University: Natural Sciences, 2006, 29(2):201–207. (in Chinese).
- [19] ZHENG Y, LIU YS, WANG YH. Recent progress in land use study in developed coastal area of China [J]. Resources and Environment in the Yangtze Basin, 2003, 12(6):509–514. (in Chinese).
- [20] LI ZB, WU SH. Safeguard and evaluation of cultivated land in Zhejiang Province [J]. Scientific and Technological Management of Land and Resources, 2005, 22(1):8–11. (in Chinese).
- [21] YANG LS, WANG GF, LIN DX. Development and utilization status and counter measures for arable land resources in Zhejiang Province [J]. Journal of China Agricultural Resources and Regional Planning, 2003, 24(4):29–32. (in Chinese).
- [22] WANG ZH, WANG KL, XIONG Y, *et al.* Trend and driving force of cultivated land use change in Hunan Province [J]. Resources and Environment in the Yangtze Basin, 2004, 13(4):53–59. (in Chinese).
- [23] LI P, LI XB, LIU XJ. Macro-analysis on the driving forces of the land-use change in China [J]. Geographical Research, 2001, 20(2):129–138. (in Chinese).
- [24] SHAO XM, YANG QY, ZHANG HY. A study on trend and driving forces of cultivated land use change in Shandong Province [J]. Geographical Research, 2001, 20(3):298–306. (in Chinese).
- [25] TAN RZ, WU CF, MOU RM. Macro-analysis of cultivated land non-agriculturalization in Zhejiang [J]. Scientia Geographica Sinica, 2004, 24(1):14–19. (in Chinese).

基于逻辑斯蒂方程的耕地需求预测——以浙江省为例

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摘要 介绍了中国浙江省的区域概况和逻辑斯蒂方程的内涵。根据 1978~2006 年相关统计数据, 分析了浙江省耕地面积的动态变化及其驱动因素。①1978 年以来, 浙江省耕地面积呈明显的波动减少趋势; ②有两个阶段耕地面积减少较快, 即 1984~1988 年和 1990~1995 年, 在此期间, 大量耕地被非农建设所占; ③经济发展、农业科技进步、人口增长因素是耕地面积变化的主要驱动因素, 人地矛盾日益尖锐, 耕地负荷越来越重; ④耕地累计减少面积随时间变化的曲线呈“S”形, 符合逻辑斯蒂方程。运用逻辑斯蒂方程对浙江省未来耕地变化情况进行了预测。预测结果显示, 至 2020 年, 浙江省耕地累计减少面积将不再增加, 届时耕地累计减少面积为 9.091 万 hm^2 , 浙江省耕地面积将稳定在 149.824 万 hm^2 水平线上或在水平线上下波动。研究表明: 随着产业结构的高级化, 城市化、工业化对耕地的蚕食并非不断增加, 而是将在某一阶段趋于停止; 随着科技进步和土地投入的增加, 为保证粮食安全所需的耕地面积将不断减少; 城市化、工业化的用地需求与粮食安全的用地需求是可以兼顾的。

关键词 逻辑斯蒂方程; 耕地需求; 预测; 浙江省

(From page 34)

[4] Rural Development Center of Beijing Municipal Science & Technology Commission. Series books of new rural science and technology extension service system construction [M]. Beijing: Weapon Industry Press, 2008. (in Chinese).

[5] HUANG XJ, ZHENG YL. Researches on the status and counter-measures of modern agricultural science and technology services—Guangdong taken as an example [J]. Chinese Agricultural Science Bulletin, 2009, 25(13):250–253. (in Chinese).

构建北京市新型农业科技服务体系的探讨

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摘要 首先, 在介绍了中国北京市农业科技服务体系发展现状的基础上, 阐述了构建北京市新型农业科技服务体系的指导思想和目标。其次, 分析了北京市新型农业科技服务体系的 6 个组成部分: 政府主管部门系统、政府公益性农技推广机构系统、村级农技推广员系统、科研院所系统、农民经济合作组织系统和涉农企业系统。再次, 提出了农业科技服务传播的 3 个途径, 即公益性农业科技服务途径、经营性农业科技服务途径和农业科技服务支撑途径。其中, 经营性农业科技服务途径又可分为政府引导型的产业化传播途径和完全市场化的技术传播途径 2 种。最后, 从机构和组织建设、人才队伍建设、机制与体制建设、支撑与保障 4 个方面探讨了构建北京市新型农业科技服务体系的具体思路。

关键词 北京市; 新型科技服务; 体系建设; 推广机构