Approach Choice and Innovative Model Design of Grass-root Agricultural Technology Promotion under the View of New Countryside

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Abstract This paper introduces the approach types of agricultural technology promotion we can choose in the process of new countryside construction, and there are mainly 6 types, namely government-domination-oriented approach, market-development-oriented approach, university (scientific research institution)-education-oriented approach, farmers' participation-oriented approach, direct-training-oriented approach and individual-service-oriented approach, including 20 models. The problems existing in the grass-root agricultural technology promotion in the process of new village construction are analyzed as follows: the awareness of innovation is not strong; scientific research, education, and promotion are disjointed; the construction of specific work system lags behind; the structure of promotion team is irrational, and the quality of promotion personnel is yet to be promoted; the cultural quality of farmers is low, and the cooperative organizations are not sound; the working conditions are poor, and the basic security is inadequate; the investment channel is simple and the supply amount is badly short; the methods of agricultural technology promotion do not adapt to the requirements of new situation. According to the characteristics and internal requirements of grass-root agricultural technology promotion, we creatively design an overall working model, and put forward new measures from objective of grass-root agricultural technology promotion, service object, service content, organization work and scope, method, role of agricultural technology personnel and so on.

Key words Agricultural technology promotion, Approach, Internal requirement, Innovative model, China

Agricultural technology promotion, agricultural scientific research and agricultural education are called as "three pillars" for the development of agriculture. In recent years, the central government and the State Council attach great importance to the reform and construction of grass-roots agricultural technology promotion system. Grass-roots agricultural technology promotion should refer to and choose more modes and ways, constantly try to practise more effective development models, summarize experience, and reveal the law, in order to adapt to the development of new situation, meet the needs of the rural areas and farmers, and make positive contributions for constructing new countryside, developing innovative services and broadening road. We introduce various forms of approaches we can choose regarding agricultural technology promotion in the process of new countryside construction, analyse the problems existing in grass-roots agricultural technology promotion in the process of new countryside construction, and design innovative model of grass-roots agricultural technology promotion.

1 Approaches of agricultural technology promotion in the process of new village construction

1.1 Government-domination-oriented approach

1.1.1 Plan-transmission-oriented approach. The government offers financial support for agricultural technology promotion activities, in accordance with the needs of agriculture and national economic development, financial and economic financial position and the preferences for agricultural technology. The promotion departments are responsible for promoting the results to agricultural production, in order to achieve the government's goal of agricultural programs.

1.1.2 Program-radiation-oriented approach. In general, the local government conducts organization and coordination; takes advantage of the process of implementing various large-scale projects (such as "Harvest Plan", "Spark Program", *etc.*); focuses on the application of various high technologies and output – increase technologies; establishes high-yield, high-quality and efficient agricultural experimental zones, demonstration areas, and technology parks; arouses enthusiasm of farmers in learning new technologies. By doing these, it can accelerate the popularization and application of agricultural technology.

1.1.3 Agricultural-technology-popularization-oriented approach. According to the agricultural production plan, in terms of policy, fund, tax and other means, the government coordinates science and technology institutions and economic sectors, publicizes and popularizes science and technology knowledge, strengthens technical training, establish high-yield, high-quality, efficient agricultural production and demonstration sites, uses the experience of a selected spot to promote the work in the entire area in the form of model, and conducts promotion and services.

1.2 Market-development-oriented approach

1.2.1 Cooperation-oriented approach. Technology institutions select the projects with the advantages of technology and resources in the local areas, and cooperate comprehensively with

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the economic entity with powerful economic strength, to form risk – and-profit-sharing community and promote the industrialization development of the local economy.

1.2.2 Contract-oriented approach. The government or technology institutions, and rural households, establish high-yield, high-quality and efficient agricultural demonstration zones or production bases, to offer technology promotion services in the form of economic contracts and so on.

1.2.3 Market-oriented approach. Technology institutions conduct joint-operation with production enterprises, or establish their own businesses to form physical-chemical technology. On the basis of publicity and popularization of knowledge of science and technology, technology institutions use the law of value and the market adjustment mechanism, to contact the rural households directly via the circulation process of the technology market, and information market, and help farmers to master the use of technology[1].

1.3 University (scientific research institution)-education-oriented approach

1.3.1 Experiment-oriented approach. On the basis of science and technology achievements, the university is to popularize and promote technology in advance, through the methods of experiment, demonstration, training, and promotion in sync, so as to realize the synchronized innovation of research and technology promotion, and promote the pertinence of demand, research, and promotion.

1.3.2 Outpatient-service-oriented approach. The university establishes agricultural technology promotion specialists compound (shift system), opens 110 hotline of agricultural technology, and receives personal visit or telephone consultation of the rural households. It also draws on the form of network. The rural households can choose to make an appointment through pool of experts serving as a record, to conduct text or video consultation. This approach is applicable to general technology promotion.

1.3.3 Entity-oriented approach. Scientific research institutions or universities, establish technology development corporation within, and assign a corresponding operation entity to each research laboratory, the equivalent of " room fore , shop after". Through seed companies, pesticide comprehensive services department and other such entities, it is to convert the scientific research results of research laboratory into physical and chemical products, to enter into market directly in the form of goods, achieving economization, socialization and industrialization of scientific research results.

1.4 Farmers' participation-oriented approach

1.4.1 Dishes-ordering-oriented approach. Before the promotion personnel formulate and determine promotion projects, they adopt the bottom-up working method, and the farmers propose the projects they need. The feasibility analysis of projects and planning of projects should involve the representatives of farmers, so that the farmers can contribute their experience and knowledge, and fully understand the content of planning of projects, which will fully arouse the enthusiasm of the farmers, in order to promote the project implementation and enforcement.

1.4.2 Development-oriented approach. Aided by the promotion personnel or informed sources, the farmers buy the new technology from the inventor of technology, to develop the products and technology that meet the needs of industrial development, practise self-production and self-selling, and take ecological, environment-friendly and virtuous circular road.

1.4.3 Association-oriented approach. The farmers who engage in the production and management of the same type of agricultural products or have the same background, cooperate voluntarily. They could establish farmer cooperatives to reflect the advantages of large-scale operation, and promote market competitiveness.

1.5 Intermediary-training-oriented approach

1.5.1 Intervention—oriented approach. There are two main forms of intermediary organizations. One is the perennially existing social service organizations which highlight social services; the other is the form of farmers' jointly self-service promotion organization, by contacting the scientific research institution, educational department, promotion department, and other departments, introducing new technology and new achievements, and passing them to each member rural household.

1.5.2 Information-consultation—oriented approach. This approach of promotion is usually the soft technology. The promotion personnel provide consultation of a variety of technologies for farmers, and provide multifarious market information during pre-production, inter-production and post-production for farmers. The promotion personnel do not directly guide the production, but carry out comprehensive services, such as establishing consultation window or mobile consultation, to guide farmers to arrange production according to market demand.

1.5.3 Media-publicity—oriented approach. Via television, newspapers, internet and other various channels, the promotion personnel are to release the results of agricultural technology, patents of agricultural technology, and other technology transfer information, to strengthen the relationship between supply and demand sides of technology. Through the publicity of a variety of media, information network, press conferences, scientific and technological exhibitions or fairs and other forms, it is to promote the trade of agricultural technology.

1.5.4 Order-form—oriented approach. In general, it is to arrange order production, according to the demand for high-quality agricultural products. Agricultural technology promotion institutions, emerge as intermediaries. Agricultural technology promotion institutions first sign orders with enterprises, select the production base, strictly adhere to standardized technology standard, strengthen itinerant technical guidance, organize and encourage agricultural technology cadres to be responsible for a task unit until it is completed in production line, award prizes to agricultural workers who are responsible for a task unit until it is completed according to the quantity and quality of purchased agricultural products, and improve the production profit of high-quality agricultural products.

1.5.5 Training-oriented approach. It is to directly establish farmers' field schools, and use informal methods of adult education, to aggregate those farmers with common problems in

production and interests of learning. Then the specific training centering on farming of the rural households is carried out, so as to realize organic integration of farmers' rural experience and modern science and technology.

1.6 Individual-service-oriented approach

1.6.1 Enterprises-footing—bill-oriented approach. Enterprises, as the main body of operation, provide funds, equipment and site, and employ and hire technology experts to offer high-tech achievements or services, so that there is ample scope for promotion. Through " enterprises + rural households " , it is to combine rural households conducting scattered production, and well-planned mass goods production, to achieve large-scale production.

1.6.2 Package-oriented approach. Based on market information, the promotion personnel actively contact the rural households during preproduction, inter-production and post-production, introduce and publicize the latest agricultural technology to the rural households, provide and recommend experts to guide the development of production, and contact other business to undertake one-stop services of management and sales. In the mean time, the promotion personnel offer real-time telephone number, to accept the need support of the rural households in 24 hours[2].

1.6.3 Enlightenment-oriented approach. A small number of promotion personnel adopt advanced farmer strategies, to transmit the new technology to people who are willing to accept innovation, so that the people can quickly understand the value of new technologies, and gain benefit due to adoption of new technologies. Other farmers begin to follow suit, and thus the effect of new technology promotion is rapidly promoted.

2 The problems existing in the grass-root agricultural technology promotion in the process of new village construction

Practice has proved that with the advance of the new rural construction in full swing, its need for the system of grass-roots agricultural technology promotion gets increasingly urgent. Meanwhile, it poses higher requirements on the fostering and development of practical technical talents in rural areas, and poses higher requirements on the transformation of functions of government technology management departments[3]. Since 2006, the system reform and construction work of grass-roots agricultural technology promotion is advancing step by step, and it has achieved great success, but compared with the above requirements, there are still some problems to be solved.

2.1 The awareness of innovation is not strong China's current agricultural technology promotion system is a planned product, with strong color of administration. For the central deployment, the enforcement is not strong in some places. In the grass-roots functional departments, there are still some problems, such as wait-and-see attitude, excessive dependence, lack of confidence, lack of vitality, insufficient innovation of work, and inadequate promotion.

2.2 Scientific research, education, and promotion are disjointed Currently, the three are subordinate to different government departments, and each forms separate system. On by mutual cooperation in work, but without intrinsic link in mechanism, will there be great difficulties regarding mutual coordination and resultant force, leading to low – level, loose, and casual combination of farmers, agriculture and countryside, which impairs the overall complementary function of education, scientific research and promotion.

2.3 The construction of specific work system lags behind The responsibilities of grass-roots agricultural technology promotion are not clear, having not decomposed the welfare functions into every promotion institution and every agricultural technology personnel. The assessment work of agricultural technology promotion is not very strict, and the measures of award and punishment are not implemented well, so that it is difficult to motivate agricultural technology personnel, and it seriously hampers the effective implementation of agricultural technology promotion work.

2.4 The structure of promotion team is irrational and the quality of promotion personnel is yet to be promoted Over the years, the grass-roots agricultural technology personnel receive insufficient training and the knowledge updates slowly; some areas do not implement the qualification access system conscientiously, leading to relatively high proportion of non-professional personnel in the team of agricultural technology promotion; due to lack of vigorous incentive measures, it is difficult to attract more university graduates to the grass-roots level, to engage in promotion services work. Currently, in the team of grass-roots agricultural technology promotion, the proportion of technology titles with no education and major is more than 20%[4], seriously affecting the elevation of the overall quality of agricultural technology promotion team.

2.5 The working conditions are poor and the basic security is inadequate In many places, the basic outlay of the agricultural technology personnel in carrying out experiments and demonstrations daily, technical training, transportation, entering villages, is not guaranteed; the performance pay and allowances in many places are difficult to fulfill, and the treatment of grass-roots agricultural technology personnel is generally poor, making that brain drains in grass-roots promotion institutions, and it lacks attractiveness; as the basic construction lags behind, the conditions of township promotion institutions are seriously backward, affecting the service quality and effect of agricultural technology promotion[4].

2.6 The cultural quality of farmers is low and the cooperative organizations are not sound Due to historical factor, institutional factor, policy factor and other factors, the farmers in China are universally ill educated, so their cultural quality, especially the ability to master modern technology, is relatively low. In addition, multitudinous rural young labor forces transfer to the secondary and tertiary industries in recent years, and the rural grass-roots organizations are very fragile, so that the farmers staying at their hometown lack market awareness and scientific management ability, to a great extent, affecting the overall quality of agricultural technology promotion[5].

2.7 The investment channel is simple and the supply amount is badly short For a long time, China's agricultural

technology promotion is funded by the state, lacking open channels for financing, but the enterprises, society and the farmers use it and benefit from it for free or with little pay. Moreover, there is a serious shortage of funds of agricultural technology promotion in China, accounting for low percentage of domestic agricultural GDP, and there is a prominent gap, compared with developed countries. In recent years, due to institutional reform, there is a phenomenon of squeezing and expropriating promotion funds, making a considerable part of the grass-roots promotion organizations are confronted with the situation of "ruptured line, broken net, quitting of people, low efficiency"[3].

2.8 The methods of agricultural technology promotion do not adapt to the requirements of new situation The existing agricultural technology promotion law has not very clear orientation of welfare of grass-roots agricultural technology promotion institutions. The functional requirements of public welfare institutions and personnel management are not standardized, and it lacks strict access conditions for agricultural technology personnel, and vigorous guarantee measures for agricultural technology promotion. At the end of 2010, National People's Congress initiated the assessment and inspection on agricultural technology promotion law, expecting further revision and perfection.

3 Innovative model design of grass-roots agricultural technology promotion

China's grass-roots agricultural technology promotion is in the golden period of development and significant period of change, so it is bound to pose new higher requirements on the operating mechanism and mode of development. According to the requirements in new situation and new stage, macroscopically this paper designs one overall mode with innovation, and poses new requirements in terms of goals, service objects, service content, organization work and scope, and method of grass-roots agricultural technology promotion, and role of agricultural technology personnel and other aspects[6], in order to arouse discussion and practice.

3.1 Objective design

3.1.1 Overall objective. We take strengthening the capability for serving agriculture as objective, speed up the system reform and construction of grass-roots agricultural technology promotion, strengthen the institution construction, team building, operating mechanism construction, and building of condition and capacity, realize "connection, weaving, congregating people, increase efficiency", and establish the grass-roots agricultural technology promotion system with clear function, sound institution, vibrant team, vigorous guarantee and efficient operation.

3.1.2 Decompose objective. It is mainly to reduce costs, improve quality and focus on the development. In order to reduce costs, we should integrate resources. We are to strengthen the system construction, select and promote dominant varieties and key technology, foster technology demonstration households, build experiment and demonstration bases, strengthen training of agricultural technology personnel, and adopt other comprehensive measures, so as to turn the grass-roots promotion service work into a whole, and play the role in integrating resources and exert the overall effect.

In order to improve the quality, we should strengthen the construction of institution and team. We are to establish and improve the efficient and vigorous promotion institutions which can provide high-quality services and satisfy farmers; consolidate the related system guarantee and funds guarantee of promotion team; in terms of working conditions, have places to handle official business, have tools to go to the countryside and have means to provide services. In addition, we are to improve the appointment system of agricultural workers, accountability system of farmer promotion, performance assessment system, training system of agricultural technology personnel, and diversified promotion mechanism[7].

In order to focus on the development, we should strengthen the construction of demonstration counties (districts). Through the implementation of the project, we are to promote the demonstration counties to establish the promotion system with clear functions, perfect institution, vigorous guarantee, and efficient operation, to use the experience of a selected spot (unit) to promote the work in the entire area, to enhance diffusion and to expand effect. There are 5 main tasks as follows: in the first place, to continue to promote institutional innovation; in the second place, to take the lead to promote new technology varieties; in the third place, promote successful experience; in the fourth place, to build experiment and demonstration base; in the fifth place, to train grass-roots agricultural technology personnel and farmers.

3.2 Design of services object It is to strengthen classification and guidance, and focus on the working thought of innovating upon the following 4 aspects of service objects.

3.2.1 Strengthen support for agricultural cooperatives. We are to actively guide, support and help the farmers to establish cooperatives, speed up the legislative process, increase support, establish credit, taxation and registration system that is conducive to the development of rural cooperative economic organizations, and promote the degree of organization for the farmers' access to markets. We are to strengthen policy support, actively guide the farmers' specialized cooperatives, agriculture-related enterprises, and agricultural professional services organizations, to carry out technical services during preproduction, inter-production and post-production, to standardize service content, to make the service standards clear, to improve service quality, to expand coverage of grass-roots agricultural technology promotion services, and to meet the diversified needs of farmers.

3.2.2 Pay attention to fostering demonstration household of agricultural science and technology. We are to strengthen the preferential policies and technical support for technology demonstration households; reinforce risk security and information feedback; dissipate the worries of technology demonstration households or big technology households; strengthen training and guidance for science and technology demonstration households; sign contract and promote the science and technology demonstration households to apply and popularize new technologies, new varieties; promote their self-development capability

and ability to push forward; further improve the express passage of converting agricultural science and technology acchivements of " experts + agricultural science and technology personnel + science and technology demonstration households" , so that the science and technology demonstration households become the important memers of agricultural technology promotion.

3.2.3 Focus on guiding small and medium-sized rural households. We should put into practice the working system of professionals of agriculture being responsible for the whole village while unifying the rural households as a whole, and push on the project of bringing science and technology into every rural household. Foreign methods of training and visiting can be adopted so as to enhance the face-to-face communication between professionals of agiculture and scattered small and medium-sized rural households. By providing the rural residents with the latest policies, new products and technology information, reinforcing live demonstration or organizing expedition, farmers can be led to improve their living situation and aquire wealth through advanced science and technology. Farmers should be led to change their backward notion and try to be the new type of modern farmers.

3.2.4 Regulate the service behaviors of agricultural enterprises. We should encourage agricultural enterprises' cooperation with the grass-roots agricultural technology promotion organizations to unfold agricultural technology promotion service. Agricultural production services should include professional prevention and cure of plant diseases and pests, operation and maintenance of agricultural machines, and the management of agricultural production resources. We should set unified standards for service behaviors and improve the quality level of the sevices. We must lead agricultural enterprises to constantly complete the unified profit mechanism between the themselves, provide farmers with market information, production technology and sales service, thus they can improve their ability in providing service and bringing along the overall situation.

3.3 Design of service content It is mainly to strengthen the financial service, information service and technology service. In terms of capital, we are to pay attention to the balance of key projects, institutional infrastructure construction, and capital allocation problem in the fields of education, scientific research, and promotion in agricultural production. In order to increase inputs in agricultural technology promotion, and solve the problem of source of capital, we can adopt the following three approaches. In the first place, we are to adjust the existing structure of supporting agriculture; reduce the government's direct capital input in agricultural production and circulation according to principles of WTO; increase the capital input in the fields of agricultural scientific research, education and promotion, according to the green box policies, so that the government capital for agricultural technology promotion reaches the international average. In the second place, we are to increase capital input in agricultural promotion, and promote the development of agricultural technology promotion cause. In the third place, we are to take the implementation of key welfare technology promotion projects as link, actively seek donations from enterprises and community, and expand investment channels for agricultural technology promotion funds.

In terms of information, we are to strengthen information network technology; build interactive sharing platform; make full use of radio, television, internet, newspapers and other modern media, to carry out the technology services; play the role of " agricultural technology 110" , " farmer mail" , short information of cell phone and other modern means, in promoting informatization of agricultural technology promotion services.

In terms of technology, we are to reinforce three systems of scientific research, promotion and training. We are to establish long-term mechanism combining scientific research and production, so that all agricultural technology forces work together in accordance with the need of agricultural industry, various types of agricultural technology achievements develop smoothly from the laboratory to the field, to form virtuous circle of demand and research, across the " last-mile" gully.

3.4 Design of organization work and scope We should pay attention to understanding the work focus of all promotion main body.

We are to strengthen the management and guidance of county-level agricultural department for township agricultural technology promotion institutions, prevent the simple promotion of the technology with the property of public goods or knowledge-products to markets, that is, the government should undertake this. The grass-roots agricultural technology promotion institutions not only carry out the experiment and demonstration to promote new varieties and new technology, but also undertake the welfare functions of plant and animal disease prevention and control, quality and safety control of agricultural products, agricultural information services, farmer education and training, agricultural emergency disposal, implementation of policy of benefiting farmers and so on[8].

We should give full play to the advantages of agriculture-related enterprises capital, technology, management, marketing, brand and so on; carry out whole-process service during pre-production, inter-production and post-production; channel high-quality and advanced technology into agricultural production; promote various kinds of agriculture scientific research institutions and teaching institutions at all levels to fulfill the responsibilities of agricultural technology promotion; guide more agriculture technology personnel to enter production line and carry out the work of agricultural technology promotion vigorously.

We are to actively organize and guide the majority of agricultural scientific research and teaching institutions to go to grass-roots experiment and demonstration bases, conduct farmer training, strengthen technical advisory services, and explore new mechanisms and new models integrating production, learning and research effectively.

We are to speed up the fostering and development of farmers' cooperatives, and give full play to the advantages of farmers' cooperatives in introducing agricultural talents, experiment and demonstration, technical training, information dissemination, and so on. Through various professional service organizations, all places provide farmers with high-quality

seeds, pest control system, unified distribution of means of agricultural production, services of agricultural production, farming, and harvesting, as well as unified organizing of agricultural product sales. They conduct things and solve the problem for single household which cannot find a way out.

We are to implement grass-roots agricultural technology promotion special post program[4], speed up the implementation of the qualification access system of agricultural technology promotion and knowledge update plan of agricultural technology personnel, and enhance agricultural technology personnel's ability to guide the practical work. The agricultural technology personnel are either the instructors, but also the liaison men, who are adept at finding experts to solve the farmers ' problems, finding enterprises to solve the farmers ' problems, and finding farmers' associations to solve the farmers ' problems, to do practical things and good things for farmers effectively.

3.5 Design of promotion methods It is to change the work plans from top-bottom to bottom-top. We are to pay attention to farmers' needs; encourage the farmers' self-conscious and self-participation; connect small production and big market; focus on the two-way communication as the basic method of modern agricultural technology promotion; extensively apply the information, network technology, the mass media, especially news media; promote the timeliness and effectiveness of information dissemination of new varieties and new technologies.

3.6 Design of role of promotion personnel of agricultural science and technology We are to focus on improving the quality of the farmers or enhancing the competitiveness of agricultural products as the main focus and innovation force; establish responsibility system of agricultural technology promotion posts; make the responsibility of promotion institutions at all levels and each agricultural technology worker clear; timely explore the constraints in agricultural production in the local areas; effectively put forward solutions to the problems; improve farmers' quality and develop human resources in rural areas, to guide the farmers consciously to depend on technological progress to develop agriculture; contact frequently with the upstream research personnel, update and acquire new technical information, and guide the farmers flexibly and effectively; broaden the international horizon, research on how to face the international market, accelerate the connection with international standards, and improve international competitiveness.

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