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Survey and Countermeasures on Current Status of Farmer Training and Education Informatization in Western Liaoning Province

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Abstract This study summarized the main achievements of farmers' training and rural informatization construction in the past few years, and explored the needs of rural informatization in western Liaoning Province. The current status of agricultural development in western Liaoning and farmers' needs for education and training and rural education informatization were surveyed. The construction of an education and technical support service platform for scientific and technological farmers in western Liaoning was proposed, aiming to use information technology to train modern professional farmers. Through independent and self-learning education and training methods, it is expected to promote great improvement in the scientific and technological quality and moral level of farmers in western Liaoning and cultivate professional farmers who are educated and understand both agricultural techniques and business management.

Key words Western Liaoning Province, Professional farmers, Education informatization, Training

1 Introduction

Western Liaoning is an area located to the west of the Liao River, bordered by the Horqin Sandy Land to the north, and bordered by Hebei and Inner Mongolia to the west and south. Its climate belongs to the semi-arid continental monsoon climate in the northern temperate zone. Long sunshine, large temperature difference, little precipitation and high accumulated temperature lead to drought, sandstorm and serious soil erosion. The annual rainfall is the lowest in Liaoning Province, and it is one of the most arid areas in China, with nine droughts in ten years. In terms of administrative division, western Liaoning includes 13 counties (cities or districts) including Jinzhou, Chaoyang, Huludao, Xingcheng and Fuxin. The land area accounts for 21% of Liaoning Province, and the farmland area accounts for 18% of Liaoning Province, and agricultural population accounts for 19.2% of Liaoning Province. Agriculture in western Liaoning occupies an important position in Liaoning Province, and the development of rural economy in western Liaoning has strategic significance for promoting the development of rural economy in Liaoning. However, due to the semi-arid area in western Liaoning, the soil is desertified, salinized, and water resources are seriously insufficient. The agricultural production conditions and ecological environment are very bad. These have become the main factors restricting agricultural production in

this area. The industrial structure, product structure and labor force structure of the agriculture in western Liaoning emphasize grain production, and the product structure is single. In the rural economic development of Liaoning Province, the west of Liaoning is relatively backward^[1]. In order to change the current mode of agricultural production, promote the level of agricultural industrialization and modernization, and accelerate the realization of the strategic goal of "breaking through in the northwest of Liaoning Province", in accordance with their own geographical location, climatic conditions, agricultural foundation, and population quality, the cities in western Liaoning have formulated development directions according to local conditions, and established a new planting and breeding industry structure that is not bound by "rain-fed agriculture, relying on the weather" and have made certain achievements.

(i) Developing water-saving agriculture. The surface runoff in western Liaoning is less, the average annual precipitation is less, and the total amount of water resources is insufficient. Drought has become one of the important factors restricting the development of agriculture in this area, and "fighting drought" has objectively become the theme of rural work in western Liaoning every year. In order to break this bottleneck, many water-saving measures such as drip irrigation, seepage irrigation, sprinkler irrigation, seepage irrigation, plastic film mulching, straw mulching, early planting and deep plowing have been vigorously promoted in western Liaoning. Since 1999, Huludao City has implemented water-saving demonstration projects in several townships, completed an investment of 10.19 million yuan, completed sprinkler irrigation and micro-sprinkler irrigation for water-saving irrigation areas of 1 133.3 ha, and saved 2.4 million m³ of water^[3]. Since 2011, in order to implement the spirit of provincial government's Conference on Promoting the Construction of 667 ha of Agricultural

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Water-saving Projects in the Northwest of Liaoning Province and the municipal government's Conference on Agricultural Water-saving Drip Irrigation Project, the city's agricultural water-saving drip irrigation projects have been implemented, striving to make the city's agricultural water-saving project implementation area reach 133 333.3 ha in five years^[4]. Chaoyang City promoted the construction of efficient water-saving projects. From 2011 to 2013 alone, the city completed 88 666.7 ha of water-saving drip irrigation projects. In 2014, it planned to add 47 593.3 ha of water-saving drip irrigation projects. Thus, it can be said that agriculture in western Liaoning has entered the "water-saving era"^[5].

(ii) Developing facility agriculture. The western Liaoning is arid with little rain and sufficient sunlight, and the climatic conditions are not conducive to the development of traditional agriculture. However, land and light and heat resources are abundant, which is suitable for the development of facility agriculture such as solar greenhouses. In recent years, western Liaoning has vigorously developed facility agriculture, which not only makes full use of the rich land resources in the area, but also avoids the impact of unfavorable climate conditions on agricultural production. At the same time of raising the level of agricultural production and driving the processing industry and service industry, production, processing and service have formed a "one-stop" industry. For example, Chaoyang City has the problem of nine droughts in ten years, and the conditions for agricultural production are very fragile. In 2009, it encountered the worst drought in 60 years, resulting in the failure of more than 1/3 of the farmland^[6]. In 2010, Chaoyang City began to implement the construction of million-mu facility agriculture, which set off an upsurge of facility agriculture construction in the city. By June 2011, the city's newly-built facility agriculture was 71 180 ha, in addition to the original construction area, the total area exceeded 123 333.3 ha, accounting for nearly 1/3 of the city's farmland area. A total of 756 000 standard solar greenhouses have been built, achieving an average of one greenhouse per household in the city. In terms of planting structure, shed vegetables were the mainstay, and emerging industries such as flowers, edible fungi and shed fruits were vigorously developed. In 2011, the city's income from facility agriculture was 10.6 billion yuan, and the per capita income of farmers increased by 3 000 yuan, which really enabled farmers to embark on a road to get rid of poverty and become rich^[7].

(iii) Developing characteristic agriculture. Characteristic agriculture is an agricultural production model that adapts to the natural and cultural environment of the region, gives full play to the advantages of traditional industries and forms a certain scale. Developing characteristic agriculture can take advantage of resource advantages, form advantageous industries, and improve economic benefits. In recent years, cities in western Liaoning have actively developed their own characteristic agriculture^[8]. For example, the jujube industry in Chaoyang County, Chaoyang City, coarse grain industry in Jianping County, the flower industry and protected vegetable industry in Lingyuan City, and the protected vegeta-

ble industry in Beipiao City have all shown a vigorous development momentum and become the driving force. Wangbao Town in Suizhong County of Huludao City used blueberries and grapes as the main varieties to create "the first town of characteristic fruits in western Liaoning". Relying on forest resources, Fuxin City has become a major furniture production base in the north. Beizhen in Jinzhou City has formed five industrialized characteristic agriculture of grain and oil, vegetables, livestock and poultry, grapes and leisure, forming a new development pattern with vigorous vitality in Beizhen agriculture.

(iv) Developing ecological agriculture. Ecological agriculture is an effective way to coordinate agricultural development and environmental protection. It attaches importance to the recycling of resources and takes into account both economic and ecological benefits^[9]. Due to the fragile ecological environment and serious land desertification and alkalization in western Liaoning, in order to realize agricultural ecological balance, ecological environment optimization and sustainable development of agriculture, ecological agriculture should be vigorously developed. In areas with sandy and alkaline land, farmland should be returned to grassland, and leguminous forages such as *Melilotus officinalis*, *Astragalus adsurgens*, and *Medicago sativa* should be planted to develop animal husbandry. In mining subsidence areas, farmland should be returned to forestry, and economic trees such as poplar, Chinese pine, locust, jujube and apple should be planted to develop forestry. It promoted the use of renewable energy such as organic fertilizers and biogas in field operation areas and facility agriculture areas, to develop the circular agriculture. Huludao City launched the Green Ecological Corridor Project in western Liaoning. By the mid-May 2012, the Western Liaoning Green Ecological Corridor Project had completed a total of 50 500 ha of afforestation and greening, accounting for 63.98% of the tasks assigned by Liaoning Provincial Forestry Department. In addition, the low mountains and hilly areas in western Liaoning are mostly far away from heavy industrial factories, and the soil and water bodies are basically free from pollution, which brings an advantageous environment for the development of organic production and green agriculture. For example, Chaoyang City has stepped up the development process of ecological agriculture, 89 products in organic agriculture, and the output has exceeded 16 000 t, area of organic agriculture more than 30 000 ha, accounting for more than 6% of the farmland in Chaoyang City^[10]. However, in order to speed up the agricultural modernization in the western Liaoning, promote the innovation of agricultural science and technology, and cultivate new professional farmers^[11], it is necessary to understand the current status of farmers, farmer training and rural informatization.

The survey on farmer training and rural education informatization shows that domestic experts and scholars have carried out some research on this aspect. Zheng Bing *et al.*^[12] analyzed and studied the current situation of training of new-type farmers in Hunan Province and the problems existing in the training process, and put forward ideas and countermeasures for the training of new-

type farmers. Guo Xiaojun^[13] pointed out that China should learn from the "trap of agricultural development" in the process of modernization in developing countries and take effective measures to accelerate agricultural transformation and promote sustainable development of agriculture. On the basis of investigation and research, Jiang Hezhong *et al.*^[14] pointed out that the main structure and training content of Chinese farmers' training supply are relatively single, and the training scale is declining year by year. As to the issue of rural education informatization, Yang Xiaorong *et al.*^[15] believed that China's rural informatization construction has made certain achievements after years of accumulation, but there are still some problems, such as the information infrastructure is weak, the rural information resources lack effective integration and sharing, and the rural scientific and technological information service capabilities are weak. Wang Shuanjun *et al.*^[16] stated that the level of development and utilization of rural information resources is low, there is a lack of informatization talents, the informatization policy environment is not perfect, and there is a big gap between urban and rural informatization. In view of the problems in farmer training and rural informatization, to solve problems such as weak farmer training infrastructure, lack of rural information resources, single content, and avoid the "trap of agricultural development" in the process of China's modernization, there are still few studies about using the network resources of agriculture-related vocational colleges to provide distance training for farmers. Therefore, we surveyed the current situation of agricultural development in western Liaoning and farmers' needs for education and training and rural education informatization through questionnaires. We proposed using the skills and resource advantages of agriculture-related vocational colleges to build an education support service platform for professional farmers in western Liaoning, so as to use information technology to carry out distance training for modern professional farmers. Through independent and self-learning education and training methods, it is expected to promote great improvement in the scientific and technological quality and moral level of farmers in western Liaoning and cultivate professional farmers who are educated and understand both agricultural techniques and business management.

2 Data sources and survey methods

2.1 Design of questionnaire Professional farmers are the main body of new rural construction, and the quality of professional farmers is the key to solving the issues of agriculture, farmer and rural area in China. Western Liaoning is located in the west of Liaoning Province. The long-term harsh natural environment and the small peasant awareness of relying on the weather have seriously restricted the agricultural production in this area. With the implementation of the "breaking through in Northwest Liaoning" strategy, the majority of farmers have gradually realized that the application of modern agricultural knowledge and agricultural technology to develop agriculture is the only way to get rid of poverty and become rich. However, the current situation of low cultural,

moral and legal qualities of farmers has seriously hindered the smooth progress of agricultural production. Therefore, carrying out scientific and technological training for farmers and cultivating farmers who are educated and understand both agricultural techniques and business management is an important means to improve the quality of farmers in western Liaoning, and also an important way to realize agricultural modernization in western Liaoning. Through the questionnaire (Fig. 1), we analyzed the basic needs of farmer training and rural education informatization in western Liaoning, studied the training content and methods in line with the actual situation of farmers in western Liaoning, to promote the training of farmers in western Liaoning, and accordingly realize the overall improvement of the overall quality of farmers in western Liaoning and train them into professional farmers. In order to fully and accurately understand the current situation of farmer training and information education in western Liaoning, we conducted a sample survey on the training of farmers in western Liaoning from October to December 2012. The survey adopted the questionnaire survey method, and the investigators conducted household questionnaires and household interviews. The sample covered five cities in western Liaoning, and the selection of survey objects mainly adopted random sampling method. A total of 3 000 questionnaires were distributed in this survey, which were filled in anonymously, and 2 898 valid questionnaires were recovered, with an effective rate of 96.6%.

2.2 Survey results The basic situation of the families surveyed by the questionnaire was shown in Table 1. The questionnaire on agricultural training evaluation of farmer training was listed in Table 2.

3 Analysis of survey results

3.1 Analysis of basic situation of families The agricultural labor force structure in western Liaoning was not reasonable, and the laborers were relatively old, mainly middle-aged and elderly. In addition, women accounted for the majority of these laborers, while male laborers were relatively small, which was connected with the transfer of youth or male labor to cities, who believed that compared with farming at home, migrating to cities would get rid of poverty and become rich faster. This required relevant agricultural institutions to issue more policies to support and benefit agriculture, step up efforts to promote and popularize new agricultural technologies and new varieties, and draw the attention of farmers back to agriculture, so as to truly realize using agriculture to support agriculture. In addition to traditional open-field planting, almost every household of the surveyed was engaged in facility agriculture, which is related to the vigorous development of facility agriculture in western Liaoning in the past 2 – 3 years. The education level of farmers in western Liaoning was generally low. More than 70% of farmers had only junior high school education or below, and less than 30% of farmers had a high school education or above. Due to lack of attention to education, farmers neglect continuing training and education, which brings certain difficulties to

the smooth development of farmers' training in western Liaoning. Furthermore, the low quality of farmers made it difficult for them to understand and accept new information, and the use of new technologies and varieties were also be limited. These not only affected the effect of farmers' training, but also restricted the popularization and dissemination of new agricultural science and technology, and hindered the development of rural economy in western

Liaoning. Under such circumstances, it is necessary to make every effort to develop basic education, extend the average number of years of education in rural areas, and fundamentally improve the overall quality of farmers. Also, publicity should be strengthened to raise farmers' awareness of the importance and necessity of education and training, and preferential policies should be put forward to encourage farmers to receive continuing education and training.

1. Age: 2. Gender: 3. Address;
4. Education level: Elementary school and below Junior high school High school College and above
5. Agricultural production: Field crop planting Vegetables Fruit trees Facility agriculture Aquaculture
6. Annual household agricultural income: <5 000 yuan 5 000 – 7 000 yuan 7 000 – 10 000 yuan >10 000 yuan
7. Participation in farmer sci-tech training: Yes No
8. Willing to participate in farmer sci-tech training Yes No no idea
9. Agricultural training should be arranged in: During the slack period During the busy period Anytime
10. Training time that can be accepted: Within one day Within one week Within one month Over one month
11. Idea towards importance of farmers' education and training to improve farmers' quality: Very important Generally important Not important
12. Training methods: Concentrated face-to-face teaching Field demonstration Individual guidance On-site practical guidance Distance education
 TV, radio, DVD
13. Consistence of the training content with the actual needs: Very Mostly Partly consistent Not at all
14. Knowledge of new sci-tech information and agricultural production technology:
 Much General Not much Never mind Not know at all
15. Channels to obtain agricultural sci-tech information: TV, radio Audio, materials, books Visiting Science popularization Farmer training courses Internet Mobile phone Friends, relatives and peers Others
16. Knowledge of agricultural education technology support service platform: Know well Know Heard of but don't know it Not know at all
17. Necessity to learn advanced technology through the above platform: Necessary Not necessary Never mind
18. Whether there is such platform in the local area: Yes No Not know
19. Have logged in to local or other such platforms: Often Occasionally Never Never heard of it
20. Desired training location: Village Township County City Not want to participate in any training
21. Acceptable training fees: Totally free Within 20 yuan Within 50 yuan Within 100 yuan Over 100 yuan
22. Knowledge of market information: Very timely Timely Not timely Not at all
23. Desired training content: Agricultural practical technology Agricultural professional knowledge Computer and network Marketing knowledge
 Agricultural law knowledge Other knowledge
24. Application of new technologies in the agricultural production process: In the entire production process In 2/3 production process In 1/2 production process In 1/3 production process No application
25. Main problems in sci-tech training: Too high fee Not suitable content Not systematic content No feedback and supervision No tracking and guidance service Insufficient technical update and training
26. Main factors influencing participation in training: No information Busy farming No suitable content Not obvious training effect Lack of local training courses Unwilling to pay training fees Want to but have no chance

Fig.1 Questionnaire on training needs of farmers in western Liaoning

Table 1 Basic family situations of the questionnaire survey

Indicator	Item	Percentage//%
Age//years old	Younger than 30	16.3
	31 – 45	34.4
	45 – 60	38.2
	Older than 60	11.1
Educational level	Elementary school and below	10.7
	Junior high school	63.1
	Senior high school	22.8
	Above college	3.4
Annual household income yuan	Less than 5 000	23.2
	5 000 – 7 000	56.6
	7 001 – 10 000	18.5
	Higher than 10 000	1.7

3.2 Analysis on agricultural training evaluation The survey results indicated that more than half of the respondents believe that technology training is helpful to improve their own quality, and they are willing to participate in such activities, and nearly 1/3 of the respondents themselves have participated in training organized by departments at all levels, which is in line with the country's continuous attention to farmers' education, the vigorous organization and management of provincial and municipal agricultural and sci-tech departments, and the continuous efforts of agricultural training institutions. It can be said that western Liaoning has made certain achievements in farmer education. However, there are still a small number of farmers who have a negative or neutral attitude towards agricultural training, showing that the efforts of various departments are not enough. For these farmers, western Liaoning

should make full use of the network to carry out distance training based on the local actual agricultural production. At the same time, it is necessary to pay attention to practical training, so that farmers can understand and learn well, and enhance farmers' interest in scientific and technological training. It is necessary to make full use of media such as radio, television, newspapers, and the Internet to vigorously publicize typical cases of outstanding students applying the new technologies and achievements learned in farmer training to get rich, give play to the exemplary role among peers, and fully mobilize the enthusiasm of farmers to participate in training. The survey found that some people want to participate in the training, but such training has not been held locally, or they have no opportunity to participate in the training due to the limited number of places and the lack of information. In view of such situation, the agricultural authorities should do a good job in publicizing the training, and should formulate some relevant policies to realize the demand of farmers to participate in agricultural science and technology training.

Table 2 Questionnaire survey on farmer training evaluation

Indicator	Item	Percentage // %
Training for improving self-quality	Very important	50.3
	General	39.1
	Not important	10.6
Training	Have participated in village, township, county or city training	28.5
	Willing to participate	77.3
	Unwilling to participate	3.7
Training season	Slack season	65.2
	Busy season	10.7
	Any time	24.1
Training time	Within one week	83.2
	Within one month	12.5
	More than one month	4.3
Training content	Meeting demands of farmers	41.9
	Basically meeting demands of farmers + other knowledge	36.2
	New technologies	21.9
Training place	Local village	85.0
	Township or county (city)	15.0
Training costs	Free of charge	96.9
	Within 50 yuan	3.1
	More than 50 yuan	0

As for the arrangement of training time and place, most people agree to use the slack time for training, and a small number of people think that it is possible to use the busy time for training, and most people can accept the training within a month. Because before the promotion of facility agriculture in western Liaoning, whether it is planting or breeding, agricultural activities are concentrated from late spring to early autumn, and the remaining months allow farmers enough time to arrange education and training. However, with the deepening of the facility agricultural project, the seasonality of agricultural planting in western Liaoning has become weaker and weaker. Even in the cold winter, it is a

good time for farmers to pay close attention to production. In terms of the training place, most farmers choose to participate in the training in their own villages or in counties close to their homes. Farmers are unwilling to participate in long-term training, and hope to solve problems encountered in the actual production process anytime and anywhere, which requires the management department and the implementation department of science and technology training to make overall plans and arrange training time and training methods reasonably. When selecting training content, the training department should fully consider the actual needs of farmers and arrange the teaching content reasonably. In recent years, the training courses held in various cities in western Liaoning for farmers mainly focus on practical techniques, interspersed with some agricultural professional knowledge. With the continuous development of agriculture in western Liaoning, a single course structure can no longer meet the needs of farmers. Many farmers hope to learn more about marketing, computer network, agricultural laws and regulations.

In terms of training costs, farmers are free to participate in the agricultural training organized by counties and cities at present, and the various expenses incurred in the training are all paid by the government, because the government is the main organizer of farmer training, while social organizations or related agricultural enterprises hardly participate. Farmer training is a big project that consumes manpower, material resources and financial resources. To benefit every farmer in this process, it is not easy to fully realize it only by relying on the power of the government. The government should formulate a series of laws related to training and introduce some preferential policies. The government should constrain social organizations or related agricultural enterprises to undertake the social responsibility of farmer training, and encourage them to actively participate in this activity, relying on the joint efforts of the government, social organizations, enterprises and agricultural vocational colleges to ensure the smoothness of farmer training.

3.3 Analysis of sources and applications of agricultural information New agricultural information, new technologies and new varieties are the key to realize agricultural modernization. Only when farmers understand, master and apply these new knowledge and technologies can they be regarded as scientific and technological farmers, and the goal of relying on science and technology to enable farmers to embark on the road to prosperity can be realized. Through the survey, we found that most farmers can understand the new agricultural resources, but the timeliness is not strong, because the means for them to obtain this information are mainly through television, radio, people's word of mouth or through regular training courses. However, the information disseminated through these channels is generally "new" agricultural resources that have been verified for a long time and have achieved good results. Some information resources have even been updated as soon as they are passed on to farmers. Although few farmers use the Internet and mobile phones as a platform for obtaining agricultural knowledge, they can solve the problem of slow knowledge updating. In fact, using the Internet and SMS to search is already a very common means of acquiring knowledge, but it has not been accepted and used by the majority of farmers. This depends on the

government and relevant departments to do a good job of publicity and popularization. Corresponding courses on using the Internet and mobile phones to retrieve agricultural information should also be set up in the training courses for farmers to ensure that farmers want to use, be able to use and know how to use when searching for agricultural information.

3.4 Survey and analysis of agricultural education informatization The network will become the main front of agricultural distance education informatization. Most of the respondents have heard of online distance education, but they don't know much about its functions and usage methods. The vast majority of people have not used the network distance education platform to update agricultural knowledge and search relevant agricultural information. The network distance education platform is based on the network and integrates agricultural technology network, agricultural technology network courses, famous teacher video lectures, promotion of new technologies and new achievements, online technology discussions, online Q&A, follow-up guidance after training, service and management. It realizes the goal of independent learning and on-demand learning for farmers, improves the construction of the agricultural information system, and truly becomes an indispensable right-hand assistant for farmers on the way to becoming rich.

4 Construction of a support service platform for professional farmer education in western Liaoning

4.1 Necessity of constructing farmer training information platform The farmer training information platform is a tool for farmer training in the information age and a concrete manifestation of agricultural informatization applied to farmer training, and also the need for vocational colleges to use existing network public resources to carry out distance teaching services and improve the construction of professional farmer education and training system. This information platform can not only meet the diversity of farmers' educational needs, greatly improve the overall quality of farmers, improve the efficiency of the use of limited farmers' training funds, but also expand the coverage of farmers' training and improve the utilization of training facilities and teachers. Promoting the development of rural vocational education by building a farmer training information platform is of great importance and practical significance for cultivating farmers who are educated and understand both agricultural techniques and business management, and for building a new countryside. In recent years, agricultural production in western Liaoning is developing in a benign manner. Modern agriculture integrating excellent ecology, advantageous industries, and high-quality products is the goal that farmers and agricultural workers in western Liaoning pursue and strive for. With the continuous development of agricultural informatization construction, agricultural websites in line with local conditions have been launched in various places in western Liaoning, such as Fuxin Agricultural Information Network, Fuxin Agricultural Expert Network, Fuxin County Jinnong Network, Jinzhou Agricultural Information Network, Chaoyang Agricultural Information Network, and Chaoyang County Jinnong Network, *etc.* These websites have

played a significant role in the disclosure of agricultural government affairs, and the release of agricultural information, but the problems in the sharing and application of agricultural digital resources are also particularly prominent. (i) The agriculture-related websites of the cities in western Liaoning are mainly constructed by agricultural government agencies. Most of the content is based on agricultural policies, agricultural news, and supply and demand information, lacking guidance and demonstration of agricultural practical technologies, and the content construction of the website is far from the actual needs of farmers. (ii) The construction mode of the website is single. Although it can realize a simple search function, the provision of agricultural information is unidirectional. Farmers can only search and view the required information, but cannot give feedback on the information, let alone ask questions and communicate online. (iii) The construction of agricultural information resources in western Liaoning is fragmented, resulting in the sporadic dispersion of massive information resources. Due to the lack of integration mechanism and scientific and unified management, coupled with the lack of a navigation system suitable for farmers, information retrieval is difficult. (iv) Most of the websites use text as the main form of expression. The single, boring form of expression and a large number of technical terms make it difficult to attract farmers' interest in learning agricultural technology in ways such as video, audio, and photos. These problems have seriously hindered the enthusiasm and initiative of the majority of farmers to learn independently through the network platform. Therefore, it is necessary to take full advantage of the excellent agricultural information resources of agricultural vocational colleges, open to the society in the form of websites, and build an agricultural information resource library and comprehensive service platform suitable for farmers, to realize remote services with the help of modern networks, so that farmers can obtain urgently needed information and knowledge in a timely, effective, accurate and economical way through the Internet. This is of great significance for improving the quality of farmers in western Liaoning and their ability to innovate in science and technology, and accelerating the development of traditional agriculture in western Liaoning to modern agriculture.

4.2 Construction mode of professional farmer training information platform The distance information education for farmers is an all-round and three-dimensional agricultural education information system. It is an information system with the national agricultural information network, cable radio and television network as the backbone, and Netcom and telecommunication networks as the transmission media. It is a systematic project. When designing and building the platform, we mainly adopted open source software LAMP (Linux + Apache + MySQL + PHP) and open source CMS technology, relies on the Internet, used the existing excellent agricultural information resources of agriculture-related vocational colleges, comprehensively used modern education technology, to realize the dissemination and feedback of agricultural technology information, search query, interactive communication, independent learning and other functions^[17].

4.2.1 Construction principles. The design principles of the farmer training platform, in addition to paying attention to the general

principles of website system design, such as reliability, security, fault tolerance, adaptability, scalability, compatibility, practicality, and ease of operation, should also include the following aspects. (i) The human friendly principle: the quality of farmers in western Liaoning is relatively low, and the operation and use of computers are inflexible and unskilled. Therefore, the structure design of the resource library should be simple and clear, intuitive, and easy to operate, so as to ensure that farmers can retrieve the required information in the shortest time. (ii) The flexible principle. The content of the resource library cannot remain unchanged. It should be updated and adjusted in time according to the agricultural development and the actual needs of farmers, allowing users of the training platform to evaluate and upload resources. (iii) The simple and clear principle. Because the main users of the system are farmers and friends, the design of the system interface should be simple and elegant, without too much cluttered information, so as not to affect the attention of learners. (iv) The timely principle. The user's request should be processed and returned in time to make the system run efficiently. (v) The integral principle. The basic functions of the system cannot be damaged, and an integral resource library system must be formed. (vi) The scientific and practical principle. The content is required to comply with laws and relevant policy regulations, and closely integrate farmers' production and living reality on a scientific basis.

4.2.2 Construction goals. (i) Building a remote training website for professional farmers and building a training platform. (ii) Developing agricultural technology network topics with regional characteristics. (iii) Opening agricultural video courses by famous teachers. (iv) Excellent teachers and experts answer questions online. (v) Promoting new agricultural technologies and achievements. (vi) Building a remote workstation to realize remote diagnosis of agricultural technology problems. (vi) Realizing the follow-up management of agriculture-related students and trainees.

4.2.3 Construction contents. (i) Video module. Using the campus network platform and data center equipment of agriculture-related vocational colleges, we can build a remote training website for professional farmers, and build a remote training network platform with a video lecture system. (ii) Online course module: develop agricultural technology network courses, such as facility agriculture, gardening, animal husbandry and veterinary medicine, agricultural machinery and rural electrical network courses with regional characteristics. (iii) Information module: promote new agricultural technologies, new varieties, new models, and new experiences, publicize agricultural public information and agricultural policies, *etc.* (iv) Communication module: discuss communication system, consultation system, information feedback system, making free communication between farmers and farmers, farmers and enterprises, farmers and experts in this system. (v) Information feedback system: through independent learning, learners will apply the acquired knowledge to the actual agricultural production. In this process, they will have more or less various problems. To provide follow-up services for farmers' training, the role of information feedback is extremely important. (vi) Online learning module: including digital library, video-on-demand system, expert teaching system, resource evaluation system. (vii) Resource sha-

ring module: including price information module, industry information module, supply and demand information module.

4.2.4 The background system design of the platform we studied is based on the characteristics of reliability, security, and usability of the platform server operating system. The operating system chooses the open source server operating system Free BSD. The background database is the open source database MySQL. The content management system adopts a modular and componentized open source CMS, to realize the separation of platform content and performance, and provide a role-based three-level user management mechanism, which is beneficial for professional farmers and network experts to open and manage their own space and manage the sections they are familiar with, so as to realize "learners teach learners". (i) Hardware environment of the platform. Since there are many resources stored in the resource library and uploads from users are accepted, the storage capacity must be large enough and expandable, and NAS (Network Attached Storage) technology can be used. The quad-core processor technology with high computing capacity and low energy consumption is adopted to meet the processing performance requirements of the platform system. (ii) Software environment of the platform. This platform supports remote teaching resources, and stable and safe software should be selected, for example, Adobe Premiere, a non-linear editing software for video production, Macromedia Flash for animation and web page making, and video software Video Converter, Adobe Audition (an audio processing software that provides audio mixing, editing, control, and effects processing functions), and picture processing software Photoshop CS, *etc.*

5 Conclusions and discussion

Now, we have entered the digital age. The big data, cloud technology, and the third industrial revolution are integrating into people's lives. Information technology (IT) is changing the production and lifestyle of human beings, and a major revolution in life, work and thinking is coming^[18]. IT will play an important role in the process of training professional farmers. On the one hand, the informatization of issues concerning agriculture, farmers, and rural areas urgently needs to solve the "last kilometer" problem. On the other hand, the teaching, practice, and practical training of agriculture-related vocational colleges are inseparable from agriculture, rural areas, and farmers, and furthermore, there should be school-enterprise cooperation with agriculture-related enterprises. Besides, agriculture-related vocational schools have rich digital resources for agricultural education and teaching, as well as expert agronomist teachers. Construction of a professional farmer education support service platform not only gives full play to the resources and equipment advantages of agriculture-related vocational schools, but also directly solves practical problems in farmers' production, and plays an irreplaceable role in national agricultural information networks, local agricultural information networks, and cable TV networks. This study solves the problem of building a professional farmer education support service platform and realizes direct communication with farmers, but how to connect with village-level agricultural stations to realize real-time diagnosis is not

solved due to equipment and other reasons. In future, we should explore the interoperability between mobile networks and farmers' mobile devices such as mobile phones. Vocational colleges have the dual mission of school education and off-campus training. Distance education training is an aspect of vocational college education. Vocational colleges should make their due contributions to the training of new professional farmers and the acceleration of China's agricultural modernization.

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