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Research on the Training Path of Agricultural Equipment Talents under the Integration of New Agricultural Science and New Engineering

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Abstract

Facing the global food crisis, accelerating the modernization of agriculture and rural areas and promoting China from a large agricultural country to a powerful agricultural country is an important mission entrusted to higher education in the new era. The cultivation of agricultural equipment talents is the key. At present, the cultivation of agricultural equipment talents in China is faced with the problems of backward agricultural equipment discipline setting, deviation of agricultural cognition concept, weak professional teachers and insufficient participation of social resources. Under the background of the integration of new agricultural science and new engineering, this paper puts forward four suggestions to optimize the training path of agricultural equipment talents. That is, to build a professional system of integration of agriculture and industry, to guide to establish rational concept of agricultural employment, to build a team of teachers with agricultural and industrial skills, and to build a comprehensive practice platform for supporting agriculture with industry, in order to provide reference for the reform and innovation of agriculture-related higher education, vigorously cultivate excellent agricultural equipment talents and ensure food security.

Key Words: New agricultural science, Talent training, Agricultural equipment talents, New engineering

1. INTRODUCTION

In order to speed up the modernization of agriculture and rural areas, vigorously implement the Rural Revitalization Strategy, and ensure national food security, under the leadership of the Chinese Ministry of Education, more than 100 presidents of China's agricultural universities and agricultural and forestry education experts have jointly proposed three important declarations, namely, ‘Anji Consensus’, ‘Beidacang Action’ and ‘Beijing Guide’. China's higher education has ushered in a new era of ‘New Agricultural Science’ construction. At the same time, in order to take the initiative to respond to the new wave of global scientific and technological revolution and industrial change, carrying out the 'New Engineering' construction by the Chinese Ministry of Education is also vigorously promoting the process. Adhering to the integrated development is an important measure jointly proposed by the construction of new agricultural science and new engineering. Strengthening the integrated development of new agricultural science and new engineering is not only an important opportunity for agriculture-related universities, but also a key way to improve the quality of talent training. According to the ‘Manufacturing Talent Development Planning Guide’ compiled by the Chinese Ministry of Education, it is predicted that by 2025, China's agricultural equipment talent gap will reach 440,000 people, and the proportion of talent gap in the top ten key areas of ‘Made in China 2025’ will reach 60.9%. This proportion ranks first in the top ten areas. The lack of agricultural equipment talents has become an important constraint on China's path to agricultural power[1]. Vigorously cultivating high-quality agricultural equipment talents is the key to promote agricultural mechanization and intelligence, and improve the level of agricultural production. It is also an inevitable requirement for colleges and universities to actively respond to national strategies and take the initiative to shoulder social responsibility under the situation of the integration of new agricultural science and new engineering. Therefore, it is of great significance to actively explore the training path of agricultural equipment talents under the integration of new agricultural science and new engineering.

2. THE INTERNAL RELATION BETWEEN THE INTEGRATION OF NEW AGRICULTURAL SCIENCE AND NEW ENGINEERING SCIENCE AND AGRICULTURAL EQUIPMENT TALENTS TRAINING

2.1 The integration of new agricultural science and new engineering is the realistic demand of agricultural equipment talents training

Agriculture is a basic industry supporting social and economic development, an important part of ensuring people's living needs, and plays an irreplaceable role in maintaining social security and stability and national independence. With the increasing demand for the quantity and quality of agricultural products, it is an important task for China to vigorously promote agricultural mechanization and intellectualization and accelerate rural modernization. Cultivating a group of high-quality and compound talents is the key goal of the construction of new agriculture science and new engineering under the background of the fourth industrial revolution, and it is also the basic requirement for agricultural colleges and universities to perform their school-running functions. It is the common concept of talent training in new agriculture and new engineering to improve the comprehensive quality of students ' practical ability, innovation ability and international vision. In the ‘Anji Consensus’ that sounded the clarion call for the construction of new agricultural science, it was clearly stated that to create a new pattern of agriculture and forestry education, it was necessary to take the road of integrated development and promote the deep cross-integration and innovative development of agriculture and industry. At the same time, in the 'Tianjin University Action' of new engineering construction, it is also proposed to carry out in-depth research and practice of new engineering with intersection and integration as the main approach. Therefore, integrated development is a historical choice jointly made by new agriculture and new engineering, which meets the practical needs of agricultural equipment talent training.

2.2 The integration of new agricultural science and new engineering provides new momentum for the cultivation of agricultural equipment talents

In the new era, the way of setting up agricultural disciplines, developing agricultural science and technology, and cultivating agricultural talents according to the traditional division of agricultural production has been difficult to meet the national strategic needs of ensuring food security and realizing agricultural and rural modernization. At the same time, the COVID-19 epidemic, local military conflicts, international trade frictions and other factors have intensified the uncertainty of food security, which further puts forward higher requirements for the cultivation of agricultural equipment talents. At present, with the rapid development of new agricultural sciences and new engineering sciences, on the one hand, vigorously developing new fields such as intelligent agriculture, unmanned farms, intelligent agricultural machinery and ecological restoration conforms to the development trend of new agricultural sciences, which requires continuous innovation and active integration of advanced engineering technology. On the other hand, the rapidly developing emerging engineering disciplines represented by artificial intelligence, genetic engineering, new materials, the Internet of things and so on have provided strong scientific and technological

support for solving agricultural engineering problems, and have gradually penetrated into all fields of agricultural engineering, which has had a profound impact on the construction of new Agricultural Sciences[2]. Therefore, strengthening the integrated development of the new agricultural science and the new engineering science, promoting the intersection of disciplines and giving play to the advantages of different disciplines can provide a strong impetus for the cultivation of high-quality agricultural equipment talents.

2.3 Cultivation of agricultural equipment talents is an important way to enhance the influence of agricultural universities

Competition in science and technology, food security, the key lies in high-quality talent groups, and talents training is an important manifestation of the value and influence of institutions of higher learning. Optimizing the training path of agricultural equipment talents and improving the quality of talents training are of great significance to the agricultural industry, agricultural universities and students. For the agricultural industry, it can promote the transformation and upgrading of the agricultural industry, broaden the agricultural industry chain, increase the added value of agricultural products, and enhance the vitality and attraction of the agricultural industry. For agriculture-related universities, they can provide more excellent talents for the agricultural industry, expand the influence of universities in the agricultural industry, and strengthen exchanges and cooperation between schools and agricultural enterprises. For students, it can improve their professional ability and comprehensive quality, enhance their personal competitiveness and ensure the quality of employment. Cultivating agricultural equipment talents in agricultural colleges and universities can we continuously inject new forces into the healthy and sustainable development of the agricultural industry, provide reliable talent support and intellectual support for ensuring national food security and realizing the major strategic needs of the country, so as to promote China from a large agricultural country to a strong agricultural country. Therefore, it is the key way and inevitable choice for agricultural colleges and universities to enhance the influence of running schools by grasping the opportunity of the integration of new agricultural science and new engineering, and vigorously cultivating agricultural equipment talents.

3. ANALYSIS ON PRACTICAL PROBLEMS OF AGRICULTURAL EQUIPMENT TALENTS TRAINING

3.1 Backward agricultural equipment discipline setting

At present, the setting of agricultural equipment disciplines in China's agriculture-related colleges and universities mainly stays in the traditional stage of division of labor based on agricultural production. The layout of agricultural

equipment disciplines obviously lags behind the needs of agricultural industry upgrading[3]. With the development of new agricultural forms such as intelligent agriculture, unmanned farms and ecological agriculture, the setting of traditional agricultural disciplines has led to the further exposure of problems such as single mode of agricultural equipment talents training, narrow professional caliber and outdated knowledge system. The education chain of agricultural equipment talents is out of touch with the innovation chain of agricultural industry. The professional quality of talents cannot meet the expectations of modern agricultural development. There is a structural imbalance between the supply of agricultural equipment talents trained by agricultural colleges and universities and the market demand of agricultural industry talents. Due to the wide coverage of agricultural equipment disciplines, involving agricultural science, engineering, biology and other disciplines, the traditional agricultural equipment disciplines and emerging disciplines are not fully integrated, and the emerging theoretical technologies and achievements such as big data, genetic engineering and artificial intelligence are not fully utilized. The lack of forward-looking layout for new agriculture and the lack of guidance and support for agricultural modernization in the new era need to be solved urgently.

3.2 Deviation of agricultural cognition concept

For a long time, the small peasant economy has dominated China's agriculture. Due to the low threshold for engaging in this traditional agriculture, the knowledge and skills of employees are generally not high, agricultural productivity is low, and agricultural producers have less income. Therefore, there is a misunderstanding in Chinese traditional thought, that is, engaged in agricultural work is often mistakenly associated with mediocrity, many talents have a resistance to engage in agricultural related work in the subconscious, this stereotype will have a negative impact on the cultivation of agricultural equipment talents[4]. On the one hand, the agriculture-related majors in colleges and universities have become the unpopular majors in the public view. The quality of students majoring in agricultural equipment is not high, and it is difficult to attract outstanding talents to study in agriculture. On the other hand, talents who have entered the agricultural equipment major will also leave the agricultural field by changing their majors during school study and changing their industries during employment, resulting in the loss of agricultural equipment talent resources. Taking the number of undergraduates switching majors in Jiangsu University in 2022 as an example, 48 students majoring in agricultural equipment such as agricultural electrification, agricultural intelligent equipment engineering, agricultural mechanization and automation were transferred out, and no one was transferred in. However, at present, China vigorously implements the strategy of rural revitalization, strives to promote the modernization of agriculture and rural areas, and attaches great

importance to food security. The modern agricultural industry facing new agriculture, taking root in new villages and developing new ecology is a promising sunrise industry. Institutions of higher learning for the publicity of modern agricultural and rural development results, to help students change engaged in agricultural work and other aspects of the ideological misunderstanding of the guidance remains to be strengthened.

3.3 Weak professional teachers

Teachers are the direct responsibility of talents training in colleges and universities. The level of teachers directly determines the quality of agricultural equipment talents training. Agricultural equipment talents for the integrated development of new agriculture science and new engineering should have comprehensive qualities such as innovation and entrepreneurship ability, multidisciplinary background and practical ability, which puts forward higher requirements for teachers in agriculture-related colleges and universities[5]. However, the development of the existing college teachers is slow, failing to keep up with the talents training needs under the integration of new agricultural science and new engineering. On the one hand, there are some problems in the introduction of agricultural university teachers, such as single channel and incomplete evaluation criteria. Most of the newly introduced teachers are directly selected from college graduates, and focus on the evaluation of scientific research results. Such teachers generally have a single experience, high theoretical level and poor practical ability. On the other hand, the use efficiency of teachers in agriculture-related universities has not been fully utilized, and the human resources of teachers have not been effectively integrated. The training of teachers' targeted business ability is not enough, and the incentive mechanism to guide teachers to continuously improve their business ability is not perfect. The overall level of professional teachers is weak, unable to meet the development needs of the integration of new agricultural science and new engineering, which will have a direct negative impact on the effectiveness of agricultural equipment talents training in the new era.

3.4 Insufficient participation of social resources

The cultivation of agricultural equipment talents under the integration of new agricultural science and new engineering has the characteristics of academic, productive and practical. Agricultural colleges and universities generally have certain advantages in academic resources, which is conducive to cultivating students' theoretical knowledge, thinking ability and scientific research ability. However, there are obvious shortcomings in the practicality of agricultural education. If we only rely on the educational resources within the school, it is difficult to cultivate high-quality

compound talents that meet the needs of the emerging agricultural industry. Outside the school, a large number of high-quality resources that meet the productive and practical needs are not fully involved in the training of agricultural equipment talents. Agricultural colleges and universities lack extensive and in-depth cooperation with other stakeholders in the training of agricultural equipment talents. Potential external favorable resources have not been actively introduced into the training of talents, and some agricultural equipment talent training models have fallen into a self-sufficient and inefficient cycle. Agricultural colleges and universities have not yet effectively established an effective cooperation mechanism with other agricultural resource subjects such as government departments, agricultural equipment enterprises, industry organizations, scientific research institutes, and so on. The external potential agricultural resources still have a large room for improvement for the comprehensive training of agricultural equipment talents[6].

4. THE OPTIMIZATION PATH OF AGRICULTURAL EQUIPMENT TALENT TRAINING BASED ON THE INTEGRATION OF NEW AGRICULTURE SCIENCE AND NEW ENGINEERING

4.1 Build a professional system of integration of agriculture and industry

The construction of agriculture-related disciplines under the integrated development of new agriculture science and new engineering is an important cornerstone of the cultivation of agricultural equipment talents. It is urgent to actively change the setting of agriculture-related disciplines that do not meet the needs of modern agricultural development. First, active layout set forward-looking new agriculture-related disciplines. Strengthen the deep integration of new agriculture and new engineering, break the boundaries of traditional disciplines, strive to create a number of cross-emerging disciplines around new industries and new formats, guide the direction of agricultural equipment talent training with discipline layout, and help agricultural transformation and upgrading. Second, upgrade the existing traditional agriculture-related disciplines. The new engineering technologies such as big data, artificial intelligence and Internet of things are fully introduced into agriculture-related disciplines to enhance the market fit of agriculture-related majors, promote the supply-side reform of agricultural equipment talent training, and promote the effective connection between talent training chain and agricultural industry chain. Third, pay attention to the construction of subject characteristics. There are many different choices for the integrated development of new agricultural science and new engineering science. Accelerating the modernization of agriculture and rural areas and improving agricultural productivity require diversified talents. Agricultural colleges and universities should combine their own characteristics and actual situation, gather superior subject resources, highlight the characteristics and key points of different

agricultural disciplines, avoid the tendency of homogenization of talents training, and explore diversified training methods of agricultural equipment talents. Fourth, optimize the curriculum, improve agricultural science and engineering blend of knowledge and ability training system. Agricultural colleges and universities should closely focus on the quality needs of new agricultural talents, further broaden the professional caliber, update professional knowledge in time, attach importance to production practice, and strive to cultivate high-quality comprehensive agricultural equipment talents.

4.2 Guide to establish rational concept of agricultural employment

The professional ability of agricultural equipment talents is the external condition to solve the practical problems of agriculture, while the recognition of modern agriculture and the belief and enthusiasm to realize personal value in agricultural production are the internal motivation. Only by cultivating agricultural equipment talents with professional ability and recognition of the agricultural industry can colleges and universities deliver stable and excellent talents for building a strong agricultural country. The first point is to change the traditional thinking. Agriculture-related institutions of higher learning should actively publicize the achievements of agricultural development in the new era, describe the prospects for rural development, introduce the trend of new agricultural development in the world, show the new development of rural areas with practical cases, and illustrate with vivid examples that it is promising to engage in agricultural production and gradually change the old cognition of agriculture in traditional concepts. The second point is to guide the value identity of agricultural undertakings. Agricultural colleges and universities can introduce the development situation of national strategies in agriculture-related fields such as rural revitalization, ecological sustainable development and food security through situation policy courses and professional introduction courses. Guide students to realize that engaging in agricultural production is the choice to adapt to the development of the times. Under the background of the integration of new agricultural science and new engineering, agricultural production workers can obtain more good opportunities for personal success. The third point is to strengthen the confidence of students engaged in agricultural production. Agricultural colleges and universities can actively promote the deeds of advanced figures in the field of agriculture to set an example and broaden their horizons for students majoring in agricultural equipment. For example, successful entrepreneurs, top scholars and government officials of agricultural authorities are invited to give lectures in schools, communicate with teachers and students, and further strengthen students ' confidence in agricultural production.

4.3 Build a team of teachers with agricultural and industrial skills

The teaching staff is an important foundation for the development of agriculture-related colleges and universities. It is the key to improving the comprehensive strength and influence of the school, and has a profound impact on ensuring the quality of agricultural equipment talents training. As Harvard University President Conant said, 'The honor of the institution is not its school buildings and the number of people, but its generations of high-quality teachers[7].' In order to cultivate excellent agricultural equipment talents, agricultural colleges and universities should focus on building a team of teachers with strong business ability and high comprehensive quality. First, scientifically formulate evaluation criteria for teacher introduction. Schools should examine the comprehensive quality and development potential of teachers from different dimensions, including scientific research achievements, research fields, subject background, learning and working experience, practical ability, not only pay attention to the current dominant indicators, but also consider the long-term recessive advantages, and include excellent talents who meet the needs of talent training under the background of the integration of new agricultural science and new engineering into the teaching team. Second, multi-channel optimization structure of teachers. Agricultural colleges and universities should fully tap the external high-quality human resources, and actively invite outstanding talents such as agricultural industry leaders and top scholars in the agricultural field to serve as part-time professors, lecturers, and honorary professors through flexible cooperation. At the same time, by holding cutting-edge lectures, setting up elective courses, and establishing joint studios, more high-quality human resources are integrated into the training of agricultural equipment talents, effectively supplementing the shortcomings of the existing teachers. Third, strengthen the team building of teachers. In view of the high standard and diversified training objectives of students majoring in agricultural equipment, agriculture-related colleges and universities should give full play to the unique advantages of teachers with different subject backgrounds, make up for the shortcomings of individual knowledge and ability, and set up a team of teachers crossing engineering and agricultural science to realize the comprehensive training of students. Fourth, improve the assessment incentive mechanism. Colleges and universities should try to mobilize the enthusiasm and initiative of teachers, encourage agriculture-related teachers to pay attention to the frontier science and technology field, carry out cross-research and teaching of new agriculture and new engineering, and guide teachers to continuously improve their personal ability through preferential policies such as title evaluation and appointment, job promotion, reward distribution and honor awarding, so as to continuously optimize the ecological environment of teacher team construction by improving the incentive mechanism.

4.4 Build a comprehensive practice platform for supporting agriculture with industry

The quality of agricultural equipment talents training is not only an important embodiment of the value of agricultural colleges and universities, but also the key concern of stakeholders such as government departments, agricultural enterprises and industry associations. Agriculture-related colleges and universities should strengthen exchanges and cooperation with other stakeholders of agricultural equipment talents, integrate external favorable resources, give full play to the advantages of emerging engineering technology, support the transformation and upgrading of agricultural education system, and jointly build a practical education platform with engineering supporting agriculture. The first is to unite rural, farm, ranch, forest farm and other agricultural production front-line enterprises to establish a practical teaching base for agricultural equipment talents to help students understand the actual needs of agricultural production. Adhere to the problem-oriented, combined with engineering technology, guide students to master solutions, explore ways to optimize, and improve the quality of agricultural equipment talents training in solving practical problems in agricultural production. The second is to introduce local governments, other agriculture-related universities, scientific research institutes and other cooperation subjects. In view of the common needs in the training of agricultural equipment talents, we should give full play to the resource advantages of cooperation subjects in different fields, jointly build a regional agricultural equipment talent sharing practice education platform, improve the use efficiency of social resources, and accumulate talent training experience. The third is to strengthen cooperation with high-quality agricultural research enterprises, guide students majoring in agricultural equipment to pay attention to cutting-edge technical issues in the new agricultural field, and carry out joint technical research between schools and enterprises. This will enhance the market competitiveness of enterprises and increase the opportunities for agricultural equipment talents to participate in the practical learning of frontier agricultural projects. By combining the technical theory advantages and human capital advantages of agriculture-related colleges with the capital advantages and market advantages of agriculture-related scientific research enterprises, a virtuous circle is formed, which not only cultivates agricultural equipment talents that meet the needs of enterprises, but also helps to improve the quality of personnel training in schools. Fourth, broaden the international vision of agricultural equipment talents. Internationalized agricultural equipment talents are an important goal of talent training under the integration of new agricultural science and new engineering. Agricultural colleges and universities should take the initiative to learn from the experience and practice of similar international colleges and universities in the training of agricultural equipment talents, actively seek exchanges and cooperation with foreign agricultural institutions, and adopt joint training and selection training to broaden the international vision of

talents. At the same time, we should actively seek exchanges and cooperation with agricultural international institutions such as The United Nations Food and Agriculture Organization and the United Nations Environment Programme, strive to cultivate and transport talents for such international institutions, strive to improve their influence in the development of international agricultural undertakings, and contribute wisdom to world agricultural development and food security.

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