ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202602_9(2).0007

Optimization Path and Practical Exploration of Talent Cultivation in Agricultural Science Universities

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Abstract

Against the backdrop of building a strong agricultural nation, agricultural universities, as the core base for providing agricultural talents, have a direct impact on the upgrading of the agricultural industry and the overall development of rural areas through the quality of their talent cultivation. This paper takes the talent cultivation of agricultural universities as the research object, reviews the initial achievements in the coverage of disciplines and the integration of industry and education in the current agricultural talent cultivation, and analyzes the core difficulties faced, such as the insufficient adaptation of disciplines and specialties to new agricultural business forms, the weakness of the practical teaching system, the restrictions on the construction of dual-qualified teacher teams, and the imbalance in the structure of talent supply and demand. On this basis, it proposes targeted optimization paths and guarantee measures from five dimensions: constructing a new agricultural science discipline system integrating "agriculture + multiple disciplines", innovating an integrated practical education model of "internship + research", strengthening the construction of dual-qualified teacher teams, improving the collaborative education mechanism between universities and localities and enterprises, and fostering a sense of patriotism and dedication among agricultural science students to serve rural areas. The research shows that the innovation of the talent cultivation model in agricultural universities needs to be based on industrial demands, focus on ability cultivation, and take into account value guidance, providing theoretical references and practical models for solving the problem of agricultural talent supply and laying a solid talent foundation for building a strong agricultural nation. At the same time, it points out the direction for the innovation of agricultural science talent cultivation in the future.

Keywords

Talent cultivation; Agricultural science colleges and universities; New Agricultural Science.

1. Introduction

Accelerating the modernization of agriculture is a major strategic task concerning the great rejuvenation of the Chinese nation and the building of a modern socialist power. The "Proposal of the Central Committee of the Communist Party of China on Formulating the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through the Year 2035" adopted at the Fifth Plenary Session of the 19th Central Committee of the Communist Party of China has listed basically achieving agricultural modernization as one of the long-term goals for basically achieving socialist modernization by 2035 [1]. The report of the 20th National Congress of the Communist Party of China clearly put forward the strategic goal of "accelerating the building of a strong agricultural country", and talent is the primary resource supporting the construction of a strong agricultural country. Agricultural colleges and

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universities shoulder multiple missions such as providing professional talents for agricultural modernization, solving agricultural science and technology problems, and serving rural development. The quality of their talent cultivation is directly related to the process of agricultural industrial upgrading and the overall situation of rural development. However, due to limitations in terms of funds and resources, the current postgraduate training in agricultural science has problems such as weakened practical teaching, lack of practical venues, and disconnection between the content of learning and research and the actual production needs [2]. Therefore, focusing on the core issues of talent cultivation in agricultural colleges and universities, by sorting out the current situation of their cultivation and the requirements of The Times, analyzing the existing deep-seated predicaments, and exploring the optimization paths and safeguard measures for talent cultivation in agricultural colleges and universities, it is expected to provide theoretical references and practical paradigms for agricultural colleges and universities to consolidate the foundation of education and supply high-quality talents for the construction of agricultural modernization.

2. Current Research Status At Home and Abroad

2.1. The Current Situation of Talent Cultivation in Domestic Agricultural Colleges and Universities

Up to now, there are a total of 80 agricultural colleges and universities in our country. There are 2 universities under the 985 Project and 5 universities under the 211 Project. As one of the first batch of agricultural and forestry universities selected for the "Double First-Class" initiative, China Agricultural University has established a three-in-one training model of "theory - practice - re-theory", innovatively explored innovations in teaching content, methods, and evaluation mechanisms, and created the "Science and Technology Small Courtyard" model, taking the path of deep integration of serving society and talent cultivation. By adhering to and improving the "Science and Technology Small Courtyard" model, we strive to cultivate more new types of talents who know and love agriculture [3]. Nanjing Agricultural University, as a key 211 university directly under the Ministry of Education, has cultivated a large number of talents for the agricultural development of Jiangsu Province and the whole country. Its agriculture and Plant protection programs were selected as the first batch of reform pilot projects for the Ministry of Education's Outstanding agricultural and Forestry Talent Education and training Program and the brand major construction project of Jiangsu Province's colleges and universities [4]. Nanjing Agricultural University, relying on its advantages in scientific research and technology promotion, has intensified cooperation with research institutes, improved the mechanism of collaborative education through science and technology, enriched the content of teaching internships, made up for the insufficiency of on-campus teaching internship conditions, and ensured the cultivation and improvement of students' social activities and practical abilities [5].

2.2. Current Situation of Talent Cultivation in Foreign Agricultural Colleges and Universities

Higher agricultural education in developed countries abroad started early and has a high degree of marketization, forming characteristic models represented by the Netherlands, the United States, Germany, Israel, etc. The University of California, Davis has established a "farm-to-table" curriculum system, integrating agricultural production, food processing, marketing and other links, with a focus on cultivating compound agricultural talents with comprehensive abilities. The university's agricultural and environmental sciences rank among the world's top, thanks to its core and distinct development characteristics: First, closely align the school's development strategy with the actual problems of the industry. Second, take into account both

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the academic planning of experts and the individualized development needs of students. Third, rely on scientific and technological innovation achievements to provide continuous impetus for industrial upgrading. Fourth, achieve precise connection between talent cultivation and market demand through improving the incentive mechanism and building an employment platform [6] Wageningen University in the Netherlands, with agricultural development as its foundation, attaches great importance to the alignment of its specialties with social demands, emphasizes the integration of industry and education in its curriculum design, strengthens the leading role of scientific research and innovation in the industry and sector, enhances the internationalization of education and international competitiveness, and has achieved a win-win situation for both the university and the industry [7]. Many domestic agricultural colleges and universities are also actively exploring the path of Sino-foreign cooperative education. For instance, the "4+0" dual student status and dual degree training model between Qingdao Agricultural University and the Royal Agricultural University in the UK enables students to receive international education without leaving the country.

Sino-foreign cooperative education, strengthening cross-border agricultural education cooperation, and cultivating talents with a global agricultural perspective through joint education, international research projects, student exchanges and other means. Chinese agricultural colleges and universities cooperate with countries along the Belt and Road Initiative to cultivate agricultural and forestry talents. Meanwhile, the United States and the Netherlands attract students from around the world to participate in agricultural research projects, discussing common issues such as food security and global climate change. Both Chinese and foreign talent cultivation, while conforming to the global agricultural development trend, have formed unique experiences based on their own national conditions: China, with "knowing and loving agriculture and serving the local area" as the core, has built a new agricultural science talent cultivation system through farming and reading education, integration of industry and education, and policy guidance. Abroad, with a focus on "technology-driven and market-oriented" approaches, high-end agricultural talents are cultivated and shaped through interdisciplinary integration, in-depth cooperation between universities and enterprises, and internationalization.

3. The Current Situation of Talent Cultivation in Agricultural Colleges and Universities

3.1. Insufficient Matching of Disciplines and Majors

Agricultural colleges and universities have established a comprehensive disciplinary system covering the entire industrial chain. Their traditional advantageous disciplines have a solid foundation. In recent years, they have added 113 new agricultural majors such as smart agriculture and biological breeding. The scale of talent cultivation has steadily increased, forming a multi-level supply system. However, there are also some problems: on the one hand, the professional Settings are disconnected from the new forms of agricultural business, and the rapid iteration of industrial technology lags behind in the supply of talents in emerging fields such as agricultural carbon neutrality and agricultural intelligent equipment. On the other hand, the degree of interdisciplinary integration is low. There are obvious barriers between traditional agricultural sciences and engineering, information science, ecological science and other disciplines. There are few interdisciplinary course modules and the integration mechanism is not sound. The cultivation of compound talents is difficult and cannot meet the demand of modern agriculture for multi-disciplinary compound talents.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202602_9(2).0007

3.2. The Practical Teaching System is Weak

At present, agricultural science colleges and universities have initially formed a prototype of collaborative education among industry, academia and research. Characteristic models such as "Science and Technology Small Courtyard" and "Five-Mentor System" are gradually being promoted, providing students with basic practical carriers. The "five-education integration" of "agriculture, rural areas and farmers" sentiment, comprehensive knowledge, scientific research ability, comprehensive quality and innovation and entrepreneurship is integrated throughout the entire process of student cultivation [8]. However, the practical teaching system still has shortcomings: First, the resources of practical platforms both inside and outside the school are limited and the collaborative ability is insufficient. The number of bases is small, mostly concentrated in traditional agricultural production links, and there is a lack of cross-regional and cross-subject resource sharing and linkage mechanisms. Second, practical courses are disconnected from the real scenarios of agricultural production. The teaching content emphasizes theoretical verification over solving practical problems. Students mostly participate in short-term visits or simulation training, lacking opportunities to deeply engage in solving problems on the production front line, resulting in a mismatch between practical operation skills and job requirements.

3.3. Imbalance in the Supply and Demand of Talents

The total number of talents cultivated by agricultural colleges and universities has continued to expand, providing a basic human resource support for agricultural modernization. However, there are obvious deficiencies in the supply and demand structure and dynamic adjustment: on the one hand, there is a mismatch between talent cultivation and the demand for grassroots agricultural positions. The supply of high-end research-oriented talents is relatively excessive, while there is a serious shortage of grassroots practical talents who understand technology, are willing to take root, and can solve practical problems. On the other hand, the supporting incentive mechanisms for talent introduction are still not sound, and there is a realistic predicament of "attracting talents but not retaining them". It is necessary to provide professional talents with solid guarantees in terms of housing, living subsidies and other aspects. Under the background of the development of the market economy, the pace of talent cultivation reform in higher agricultural education has failed to keep up with the increasingly diverse demands of the labor market in a timely manner [9]. The shortage of talents in the labor market and the inability of talent cultivation to meet market demands have led to a relatively low efficiency in talent allocation among college students.

3.4. The Mechanism for Cultivating the Sentiment of Knowing and Loving Agriculture is Not Sound

Some agricultural colleges and universities have launched distinctive activities such as farming and reading education and rural volunteer services. The science and technology small courtyards cultivate students' feelings towards agriculture, rural areas and farmers in practice, and guide talents to go down to the grassroots level through policies such as "free agricultural science students", making certain explorations in the cultivation of sentiments. However, systemic deficiencies have not yet been resolved: First, the integration of ideological and political education with agricultural science professional education is low, and a systematic cultivation system for the "agriculture, rural areas and farmers" sentiment has not been formed. Most ideological and political courses mainly focus on general content and lack characteristic modules that are combined with agricultural production and rural revitalization practices. Second, there is a shortage of practical carriers for grassroots agricultural services, and students' participation in grassroots services is low. As a result, it is difficult for them to deepen their emotional identification with "knowing and loving agriculture" through practice. This

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leads to some students having a weak sense of identification with agricultural positions and lacking a sense of mission and action to serve rural revitalization [10].

4. Optimized Paths for Talent Cultivation in Agricultural Colleges and Universities

4.1. Build a New Agricultural Science Discipline and Professional System

Dynamically add emerging majors, focus on new agricultural business forms such as smart agriculture, biological breeding science, agricultural carbon sinks, and agricultural intelligent equipment, and establish a dynamic mechanism for the entry and exit of specialization. Build a "agriculture + multi-disciplinary" compound discipline cluster, break down disciplinary barriers, form cross-disciplinary teams in agriculture with information technology, ecological environment, food engineering, etc., and develop cross-disciplinary integrated course modules.

4.2. Improve the Practical Teaching System

Integrate resources such as on-campus experimental fields, enterprise production bases, local agricultural technology extension stations, and demonstration villages for rural revitalization, form a cross-regional and cross-subject practical platform alliance, clarify the responsibilities for co-construction between the school and the local area as well as between the school and enterprises, implement the mechanism of "shared bases, mutual employment of teachers, and joint research of projects", and establish a full-chain practical project database to solve the problems of insufficient number and single functions of bases. Promote an integrated teaching model of "internship + research" Transform practical challenges such as pest and disease control, variety improvement, and technology promotion on the front line of agricultural production into practical topics, extend the practical period, optimize the practical assessment methods, incorporate farmers' satisfaction, technology adoption rate, and the conversion rate of scientific research achievements into core assessment indicators, promote the in-depth connection between course content and production scenarios, and enhance students' ability to solve practical problems.

4.3. Establish a Precise Matching Mechanism for Talent Supply and Demand

Deepen the targeted training cooperation between schools and local authorities as well as enterprises, jointly build training programs with local agricultural and rural departments and leading enterprises, and provide targeted supply of practical grassroots talents who are proficient in technology and willing to take root, so as to alleviate the problem of mismatch in supply and demand structure. Connect the data from industrial parks and human resources departments, build early warning indicators covering dimensions such as the number of job vacancies, core skill demands, and changes in salary levels, and establish a dynamic indicator mechanism. Universities adjust their enrollment plans based on the early warning information, increase the number of students enrolled in shortage majors, and optimize the training programs to achieve the transformation of talent cultivation from supply to demand.

4.4. Strengthen the Cultivation of The Quality of Knowing and Loving Agriculture

Offer ideological and political courses with agricultural science characteristics, integrate farming and reading culture as well as typical cases of rural revitalization into ideological and political teaching, and achieve the same direction and progress of professional education and ideological and political education. Form volunteer service teams for rural revitalization and organize student teams to participate in rural volunteer services, doing practical things and solving problems for villagers. Establish a system and measures for evaluating and awarding excellence based on service duration to stimulate students' enthusiasm for serving rural areas.

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5. Guarantee Measures for Talent Cultivation in Agricultural Colleges and Universities

5.1. Policy Guarantee

At the national level, special support policies for the construction of new agricultural sciences have been introduced. Emerging majors in agricultural science universities have been included in the key support list for the construction of "National First-Class Undergraduate Majors", with separate enrollment quotas and preferential financial subsidies provided. Establish a cross-departmental collaboration mechanism, with the Ministry of Education, the Ministry of Agriculture and Rural Affairs, the Ministry of Human Resources and Social Security, and the Ministry of Finance jointly formulating talent cultivation plans, and providing policy dividends in aspects such as scientific research project approval, employment and household registration, and professional title evaluation. Provincial governments have introduced local policies to provide guarantees for the construction of scientific research and practice bases in agricultural colleges and universities. Colleges and universities explore interdisciplinary management mechanisms, break down administrative barriers among departments, and grant them the autonomy to make decisions on curriculum design, faculty allocation, and fund utilization, thus clearing institutional obstacles for the integrated cultivation of "agriculture + multiple disciplines".

5.2. Resource Assurance

A "Special Fund for Agricultural Science Talent Cultivation" has been established. Each year, universities allocate a portion of the funds to the construction of interdisciplinary fields, the upgrading of practical bases, the training of "dual-qualified" teachers, and subsidies for students' grassroots services. Expand multiple funding channels and raise funds through methods such as school-enterprise cooperation, school-local cooperation, and support and cooperation from leading enterprises. The funds invested by enterprises in talent cultivation can enjoy tax deductions in accordance with regulations.

Integrate the experimental fields on campus, enterprise production bases and grassroots agricultural technology extension stations. The government will take the lead in coordinating land and funds, universities will be responsible for operation and management, and enterprises will provide technical support to achieve resource sharing. Build a virtual simulation teaching platform, invest special funds to develop digital resources for digital agriculture and virtual training platforms, covering the entire agricultural production process and making up for the time and space limitations of physical bases.

5.3. Evaluation Assurance

Establish an evaluation index system covering aspects such as the quality of talent cultivation, the effectiveness of new agricultural science construction, the depth of industry-education integration, and the contribution to social services. Strengthen the evaluation model of teachers' "teaching + practice" and break the system of valuing only papers. Introduce third-party evaluation institutions to conduct independent assessments every year, and link the evaluation results to the college enrollment quotas and the allocation of special funds. Reduce the number of students admitted to agricultural science programs in universities that fail the review. Every year, based on the evaluation results and feedback, the talent cultivation plan, the direction of resource allocation and the focus of policy support are adjusted. For instance, in response to the issue of insufficient practical ability among students of a certain emerging major, the investment in practice bases is increased and the practice period is extended.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202602_9(2).0007

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