Supply-Demand Contradictions and Challenges of Agricultural Digitalization Talents under the Agricultural Power Strategy

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Abstract: The advancement of the agricultural powerhouse strategy relies on science and technology innovation driven by digital transformation, yet structural mismatches in the supply and demand of agricultural digital talent, coupled with deep-seated challenges such as lagging training systems and disconnects with industry practices, have become critical bottlenecks hindering strategic implementation. This study, based on in-depth analysis of current job postings for agricultural digital positions, identifies three core contradictions: "high demand versus low supply," "complex skill requirements versus single knowledge structure mismatches," and "industry practice advancements versus educational training lags." These issues further lead to multiple dilemmas, including "insufficient effective supply," "disconnected training systems," "strategic coordination gaps," and "limited career appeal." Consequently, the study proposes a systematic reform through three pathways: building a new paradigm of industry-education integration, optimizing strategic supply and ecological environment, and reshaping the appeal of agricultural digital careers, aiming to provide robust talent support for the agricultural powerhouse strategy.

Keywords: Agricultural Powerhouse; Digital Agriculture; Talent Supply and Demand; Digitalization of Agriculture; Talent Cultivation

1. Introduction

Building a strong agricultural country is the only way for China's modernization. The digital transformation of agriculture is not only a strategic choice to improve production efficiency and ensure national food security, but also a necessary path to achieve modernization of agriculture and rural areas and comprehensively promote rural revitalization[1]. The fundamental driving force and ultimate results of this transformation come from a high-quality team of agricultural digital talents. Compared with the urgent strategic needs in reality, the construction of China's agricultural digital talent team faces severe challenges. On the one hand, policies and markets have shown great enthusiasm for agricultural digitization, with increasing investment in fields such as smart agriculture and digital rural areas, giving rise to a massive demand for new talents; On the other hand, the transformation of the talent training system in agricultural universities is slow, and there is a significant gap between the knowledge and skill structure of graduates and the actual needs of the industry, leading to the paradox of "difficulty in enterprise recruitment" and "difficulty in student employment" coexisting.

The relevant research on agricultural digitization and talent cultivation mainly includes: firstly, the study of the connotation and value of agricultural digital transformation. Scholars generally believe that digital transformation is the digital reshaping of the entire chain of agricultural production, operation, management, and services[2-3]. Its value is reflected in multiple dimensions, such as improving resource utilization efficiency, optimizing supply chains, fostering new business models, and promoting green and sustainable development[4-5]. Especially, the digital economy has injected new momentum into agricultural modernization through the sharing of infrastructure, technology, talent, and information[6]. The second is the research on the current situation and characteristics of the demand for digital talents in agriculture. Numerous literature points out that the digital transformation of agriculture has given rise to a new demand for versatile and innovative talents. The demand for talent has shifted from traditional agricultural skills to "new farmers" who possess both agricultural scientific knowledge, digital technology

application ability, and industrial management literacy [7-8]. Thestudy further reveals the multi-level nature of demand, which includes not only high-end R&D and architecture talents, but also an urgent need for a large number of application-oriented and technically skilled talents who can go to the front line, engage in technology promotion, intelligent equipment operation and maintenance, and data analysis services[9-10]. Case studies on specific regions (such as Henan Province and Southern Xinjiang) and specific fields (such as facility agriculture and rural economic management) also confirm the urgency and regional specificity of talent demand[11-12]. The third is the research on the problems and countermeasures of cultivating digital talents in agriculture. Existing research generally believes that there are significant shortcomings in the current talent cultivation system. If education is disconnected from industry, the curriculum system is outdated, and cutting-edge content such as big data and artificial intelligence is not timely integrated; Weak practical teaching links and lagging construction of practical training bases; Insufficient digital literacy of the teaching staff; The integration of industry and education often remains a formality, lacking a deep integration mechanism [13-14]. Based on existing research, it can be seen that the cultivation of digital talents in agriculture is of great importance and urgency. However, most studies focus on reforming the education supply side analysis and training mode, or describing the vision of talent demand in the demand industry side. There is a lack of research on systematically analyzing the contradictions between "supply" and "demand" within the same analytical framework. Especially, there is still a lack of in-depth deconstruction of the specific mismatches and institutional and structural causes that exist between supply and demand in terms of knowledge structure, ability requirements, training cycles, and usage scenarios.

Based on this analysis, what specific and structural contradictions exist between the supply and demand of agricultural digital talents in the context of the strategy of building a strong agricultural country? What kind of dilemma have these contradictions encountered? What is its underlying cause? In order to provide accurate decision-making references for building a new type of agricultural digital talent training system that effectively connects industrial needs

and conforms to educational laws.

2. Characteristics of Demand for Agricultural Digital Talents Based on Recruitment Information

Through sorting out the recruitment information of multiple agricultural enterprises and government departments such as DJI Agriculture, Beidahuang Agricultural Clothing, and Sinochem Modern Agriculture, it can be found that the current demand for digital talents in agriculture presents the following distinct characteristics.

2.1 Requirement Compounding and Deepening

The job requirements have far exceeded the scope of traditional agricultural knowledge, presenting a highly cross compound feature of "agriculture+digitalization+management". For example, an "agricultural big data analyst" needs to have knowledge of agricultural production, basic statistics, and data mining tools such as Python/Pandas; Smart Agriculture Solution Engineer "needs to be proficient in understanding agricultural scenarios, configuring IoT hardware, and operating software platforms. Recruiting units generally require candidates to be able to solve complex problems in agricultural real-life scenarios, rather than just mastering a single technology or theory.

2.2 High Requirements for Practical Experience and Problem-solving Skills

Except for basic technical positions, the vast majority of positions require relevant project experience or practical experience. The position of "Agricultural IoT Manager" requires "at least 2 years of relevant experience, familiar with smart agriculture, and familiar with the characteristics of crop maintenance"; The 'Digital Agriculture Solution Engineer' needs to have 1-3 years of relevant work experience and pre-sales technical support experience. This reflects the high expectations of the production industry for the immediate combat effectiveness of talents, rather than just valuing their academic background.

2.3 Diversification of Demand Levels

The demand includes not only a small number of high-precision R&D talents, such as algorithm engineers and architects, but also a large number of "technology+service" talents who can sink to

the fields for technology promotion, application maintenance, and training guidance. The latter is a key bridge connecting cutting-edge digital technology with traditional agricultural production, with a huge demand gap.

2.4 Competition between Industries in Terms of Salary, Benefits, and Ability Requirements

Excellent compound talents are also the target of competition in Internet, finance and other industries. The salary level provided by agricultural enterprises often does not have an advantage in competing with traditional industries for similar digital technology talents, which further exacerbates the difficulty of "talent attraction" in the agricultural field.

3. Supply Side Analysis of Agricultural Digital Talents

Compared with the demand side, the supply side of agricultural digital talents faces a lag and mismatch in the training system.

3.1 The Reform of Talent Cultivation Mode in Universities Lags Behind

At present, the curriculum system of agricultural and forestry economic management, agronomy and other related majors in many higher education institutions is updating slowly, and the teaching content is still mainly based on traditional theories, with insufficient integration and penetration of digital technologies such as big data, artificial intelligence, and the Internet of Things. There is a common phenomenon of 'those who understand agriculture do not understand digital technology, and those who understand digital technology do not understand agriculture', which leads to a single knowledge structure for graduates and makes it difficult to meet the complex requirements of the position [15].

3.2 Weak Practical Teaching Links and Insufficient Integration of Industry and Education

Agricultural digitization is a highly scenario based field, and it is difficult to cultivate qualified practical talents without a real agricultural production environment. At present, the construction of practical training bases in many universities is backward, and the cooperation with leading agricultural technology enterprises is not deep enough. Students lack opportunities to exercise and solve practical problems in real projects. This means that although graduates may have theoretical knowledge, their practical skills and ability to solve on-site problems are seriously lacking, which is a huge gap from what recruiters expect.

3.3 Incomplete Career Development and Lifelong Learning System

The rapid iteration of digital technology requires talents to have the ability to continuously learn. However, the digital skills enhancement training system for existing agricultural practitioners, including agricultural technology extension personnel, new business entities, etc., is not yet sound, with limited coverage and training content often lagging behind the forefront of technological development. This has led to slow improvement in the digital literacy of the existing workforce, making it difficult to effectively fill the talent gap.

4. The Core Contradictions and Practical Difficulties in the Supply and Demand of Digital Talents in Agriculture

4.1 Core Contradiction

The first is the contradiction between high strategic demand and low effective supply. The demand for digital talents in the strategy of building a strong agricultural country is enormous and urgent, but both the quantity and quality of college graduates and existing transitional personnel cannot effectively meet market demand.

The second is the contradiction between highly complex skill requirements and a single talent cultivation structure. The industry needs "specialists" based on "generalists", while the supply side outputs mostly "traditional specialists" with relatively single knowledge structures, lacking cross-border integration capabilities.

The Third is contradiction between rapid iteration of the tertiary industry practice and lagging education and training cycles. The rapid development of technology and application scenarios, coupled with the long training cycle of higher education and the inflexible adjustment mechanism of the curriculum system, have resulted in talent cultivation always being "slow and slow".

4.2 Realistic Difficulties

The first is insufficient effective supply. The

development of modern agriculture requires digital practical operation talents, but the existing talent cultivation practices in universities are insufficient, and a large number of graduates require enterprises to invest a lot of costs in retraining.

The second issue is the disconnection of the training system. Multiple entities such as universities, governments, and enterprises have not yet formed a joint force in talent cultivation, and the mechanism of industry education integration and collaborative education is not smooth enough.

Thirdly, there is a lack of policy coordination. The policy synergy between departments such as agriculture, education, science and technology, and human resources and social security needs to be strengthened, and a unified direction and joint force have not yet been fully formed in the formulation of talent standards, training plans, incentive guarantees, and other aspects.

Fourthly, the career attractiveness is limited. Due to the low comparative efficiency of agriculture, the salary and development prospects in the agricultural field are relatively lacking in competitiveness, and the attractiveness to top digital technology talents is limited.

5. Ways to Resolve the Contradiction between Supply and Demand of Agricultural Digital Talents and Policy Suggestions

5.1 Building a New Paradigm of Education that Deeply Integrates "Government Industry Academia Research Application"

The first is to reform the curriculum system. Breaking down disciplinary barriers, promoting deep cooperation between the School of Information, the School of Data, and the School of Agriculture, jointly designing and developing micro majors, minor degrees, or interdisciplinary degree programs for "agricultural digitization", deeply embedding digital skills such as Python programming, data analysis, sensor principles, and drone applications into traditional agricultural courses.

The second is to jointly build a practical platform. Encourage universities to establish modern industrial colleges, joint laboratories, and internship training bases with leading agricultural technology enterprises such as DJI, Jifei, and Beidahuang Information Company. Promote project-based learning, allowing students to participate in real agricultural digital projects during their school years and accumulate practical experience.

The third is to promote teacher exchange. Introduce enterprise experts as industry mentors, and select university teachers to serve in enterprises for on-the-job training, creating a "dual teacher" teaching team that understands both theory and practice.

5.2 Optimizing Policy Supply and Talent Development Ecological Environment

The first is to strengthen top-level design and departmental collaboration. Led by the Central Agricultural Office or the Ministry of Agriculture and Rural Affairs, in collaboration with the Ministry of Education, the Ministry of Science and Technology, the Ministry of Human Resources and Social Security, and other departments, a national plan for the development of digital talents in agriculture will be jointly formulated to clarify goals, tasks, and departmental responsibilities, forming a policy synergy.

The second is to establish a sound talent evaluation and incentive system. Break the tendency of only focusing on academic papers and qualifications, and establish evaluation standards for agricultural digital talents guided by practical abilities and industry contributions. We will give preferential treatment to outstanding talents who have devoted themselves to the field of agricultural digitization in terms of professional title evaluation, project application, award selection, and other aspects.

The third is to expand the effective supply of continuing education. Relying on vocational colleges, leading enterprises, and social training institutions, large-scale digital skills training will be carried out for family farmers, cooperative leaders, and agricultural technicians to enhance the digital literacy of the existing workforce.

5.3 Reshaping the Attractiveness of Digital Agriculture Profession

The first is to improve salary and development prospects. Encourage agricultural enterprises to enhance the salary competitiveness of core digital talents through equity incentives, project dividends, and other means. At the same time, clearly plan their career development path and let them see that they can also achieve brilliant career achievements in the field of agriculture.

The second is to tell the story of the "new farmers" in the new era well. Intensify the promotion of leading figures and successful cases in the field of agricultural digitization, change the stereotypical image of agriculture as "facing the yellow soil and facing the sky" in society, showcase the sense of technology, future, and value of smart agriculture, and attract more young people to apply digital technology to vast fields.

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