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Study on influencing factors of agricultural scientific and technological achievements transformation in Yunnan Province from the perspective of scientific and technological consultation

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ABSTRACT
From the perspective of scientific and technological consultation, this paper studies the factors influencing the transformation of agricultural scientific and technological achievements in Yunnan Province. Structural equation model was used to analyze the effects of policy support, scientific research ability, market demand and scientific and technological consulting service on the transformation of agricultural scientific and technological achievements. The model was verified and analyzed by collecting information through questionnaire survey and relevant statistical data. The results show that policy support indirectly promotes the transformation of results through improving scientific research capacity, market demand and promoting scientific and technological consulting services, and research capacity and market demand directly affect the transformation of results through scientific and technological consulting services, and policy support and scientific and technological consulting services play an important intermediary role in the transformation process.

KEYWORDS
transformation of agricultural scientific and technological achievements; Scientific and technological consultation; Structural equation Model (SEM)

The effective transformation of agricultural scientific and technological achievements is an important means to realize agricultural modernization and rural economic development. Yunnan Province is a big agricultural province, the transformation of agricultural scientific and technological achievements is of great significance to its economic development and farmers' income increase. However, in practice, the transformation of agricultural scientific and technological achievements faces many obstacles and challenges. As an important bridge connecting scientific research institutions, the government and the market, scientific and technological consultation plays an important role in promoting the transformation of scientific and technological achievements. This paper aims to study the influencing factors of the transformation of agricultural scientific and technological achievements in Yunnan province from the perspective of scientific and technological consultation, and put forward relevant suggestions.

1 Research background and literature review

The transformation of agricultural scientific and technological achievements refers to the process

of applying the achievements of agricultural scientific and technological research to practical production. Studies have shown that policy support, scientific research capacity, market demand, scientific and technological consulting services and other factors have a significant impact on the transformation of agricultural scientific and technological achievements.

Policy support: The government's policy support is an important driving force for the transformation of scientific and technological achievements. The research shows that the government can effectively promote the transformation of scientific and technological achievements by formulating preferential policies, providing financial support and establishing science and technology incubators.

Scientific research capacity: The scientific research capacity of scientific research institutions directly affects the quality and transformation efficiency of scientific and technological achievements. The high level of scientific research capability can not only produce high-quality scientific and technological achievements, but also provide effective technical support and solutions.

Market demand: The success of industrialization and marketization of scientific and technological achievements often depends on whether it can effectively meet market demand.

Scientific and technological advisory services: In the process of promotion and application, technology transfer and market development, scientific and technological advisory services play a key intermediary role. By providing professional technical consulting, market analysis and project management services, it effectively promotes the transformation and actual landing of scientific and technological achievements.

1.1 Research methods

In this paper, structural equation model (SEM) was used to analyze the factors affecting the transformation of agricultural scientific and technological achievements in Yunnan Province. Structural equation model is a statistical method that can comprehensively consider the relationship between multiple variables, and can effectively analyze the influence of multiple factors on the transformation of scientific and technological achievements. By using easy to measure and intuitive indicators to indirectly observe latent variables, the core idea of the SEM model is to minimize the difference between the sample Covariance matrix and the model estimation covariance matrix, so it is also known as Covariance Structural Modeling[1].

At present, many scholars have applied structural equation model to the research of scientific and technological achievements transformation. For example, Xing Xiaozhao and Li Shanqing[2] use structural equation model to deeply explore the evaluation index system of scientific and technological achievements transformation maturity. Lu Wei and Zhang Haijun[3] took 30 colleges and universities in Liaoning Province as research objects, and analyzed the influencing factors of the transformation performance of scientific and technological achievements in local colleges and universities by using structural equation model. Through questionnaire survey and data analysis of 204 enterprises, intermediaries, universities and government institutions in Shanghai, Liu Yongqian[4] constructed the corresponding structural equation model and analyzed in detail the roles of all parties in the transformation of scientific and technological achievements and their correlation relationships, thus providing a theoretical basis for improving and perfecting the current policy of transformation of scientific and technological achievements.

1.2 Data Sources

The research data in this paper mainly come from questionnaires and relevant statistical data.

The respondents included scientific researchers, agricultural enterprises and scientific and technological consulting institutions in Yunnan Province, and the data was collected from the "2024 Yunnan Junior Technology Broker (Intellectual Property Operation Special Event of Yunnan Wuhua Industrial Park)" activity. Through questionnaire distribution and formal investigation, 278 valid questionnaires were obtained, with a sample size of more than 200, which is representative. The specific composition of the respondents: 45.32% are from small and medium-sized agricultural enterprises, 30.22% are from universities and scientific research institutions, 10.07% are from third-party scientific and technological consulting agencies, and 14.39% are from government agencies. 70.14% were engaged in the work related to the transformation of scientific and technological achievements, and 29.86% were not engaged in related work. Among those engaged in related work, 60.07% have worked for 0-3 years, 24.82% have worked for 3-5 years, 10.07% have worked for 5-10 years, and 5.04% have worked for more than 10 years.

1.3 Variable Setting

According to the literature review and the purpose of the study, the following main variables are set in this paper:

Policy support (PS) : the government's policy support for the transformation of agricultural scientific and technological achievements.

Research capability (RC) : The research capability and level of the research institution.

Market demand (MD) : The degree of market demand for agricultural scientific and technological achievements.

Scientific and technological Advisory Services (CS) : Quality and level of scientific and technological advisory services.

Result conversion effect (TE) : The conversion effect of agricultural scientific and technological achievements.

In the process of studying the transformation of agricultural scientific and technological achievements, the relationship between variables can be clearly demonstrated by structural equation model (SEM). The following are the detailed relationships among the variables and their influencing mechanisms:

1.3.1 Policy Support (PS)

The policy support provided by the government in the process of the transformation of agricultural scientific and technological achievements includes measures such as financial subsidies, tax incentives, and technical incentives.

Relationship with other variables:

Research capacity (RC) : Policy support can improve research capacity by promoting R&D investment and resource allocation in research institutions. For example, policy support may be provided by funding research projects to improve the working conditions of researchers and the level of research equipment.

Market demand (MD) : Strong policy support can help guide market demand for agricultural scientific and technological achievements. For example, government policy support for the promotion and application of new technologies may stimulate market demand for these technologies.

Scientific and technological advisory Services (CS) : Policy support can promote the professionalization and standardization of scientific and technological advisory services, for example, government subsidies or incentives may be used to improve the quality and level of

advisory services. Translation of results (TE) : Policy support ultimately promotes the translation of results by enhancing research capacity and market demand, and promoting scientific and technological advisory services.

1.3.2 Research Capability (RC)

The level of technological research and development of scientific research institutions, the professional ability of scientific research personnel and the quality of scientific research results.

Relationship with other variables:

Market demand (MD) : A high level of scientific research capability can better meet the market demand for agricultural scientific and technological achievements. Through innovation and research and development, scientific research institutions can produce scientific and technological achievements that are more in line with market demand.

Scientific and technological consulting service (CS) : The improvement of scientific research ability can enhance the professionalism of scientific and technological consulting service, and the professional level and experience of scientific and technological personnel directly affect the quality of consulting service.

Achievement transformation effect (TE) : Scientific research ability directly affects the quality and applicability of agricultural scientific and technological achievements, and thus affects the transformation effect of achievements. A high level of scientific research ability can produce results that are more competitive in the market.

1.3.3 Market Demand (MD)

The degree of market demand for agricultural scientific and technological achievements, including the acceptance and application willingness of new technologies and new products.

Relationship with other variables:

Science and Technology Advisory Services (CS) : Changes in market demand can affect the focus and direction of science and technology advisory services. For example, increased market demand for a particular technology may prompt the SBSTA to provide related advisory services.

Results transformation effect (TE) : The intensity of market demand directly affects the transformation effect of scientific and technological achievements. The high-demand market can better absorb and apply scientific and technological achievements, and enhance the commercialization and industrialization of achievements.

1.3.4 Technical Advisory Services (CS)

Consultation and service support in the process of agricultural scientific and technological achievements transformation, including technical consultation, market analysis, transformation strategy, etc.

Relationship with other variables:

Results conversion effect (TE) : The quality of scientific and technological consulting services directly affects the conversion effect of results. High-quality consulting services can provide effective market entry strategies and technology transformation schemes to improve the market adaptability and application effect of the results.

1.3.5 Result Conversion Effect (TE)

The performance of agricultural scientific and technological achievements in practical

application, including the market acceptance of the technology, economic benefits, social benefits, etc.

Relationship with other variables:

Policy support (PS), research capacity (RC), market demand (MD), and scientific and technological advisory services (CS) : The results translation effect is affected by all of these variables. The environment and resources provided by policy support, the technical quality brought by scientific research capacity, the intensity of market demand, and the support of scientific and technological advisory services will all affect the actual transformation effect of the results.

Policy support (PS) indirectly influences results translation (TE) by influencing research capacity (RC), market demand (MD), and scientific and technological advisory services (CS).

The impact of research capability (RC) and market demand (MD) on the result conversion effect (TE) is mainly achieved by improving the technology quality and meeting the market demand.

Scientific and technological advisory Services (CS) directly affect the results conversion effect (TE), providing critical support and guidance in the transformation process.

Through the analysis of the above relationship, the role of different factors in the transformation of agricultural scientific and technological achievements in Yunnan Province can be obtained, which provides a solid theoretical basis for further research and practice, and better grasp the interactive relationship and overall effect among various influencing factors.

2 Construction of structural equation model

According to the above variables and their relationships, this paper constructs a structural equation model (SEM) that affects the transformation of agricultural scientific and technological achievements in Yunnan Province. SEM model includes measurement model and structure model. The measurement model is used to verify the relationship between latent and observed variables, while the structural model is used to verify the relationship between latent variables.

2.1 Measurement model

The measurement model defines the relationship between latent variables (such as policy support, research capacity, etc.) and their corresponding observed variables. For example, policy support (PS) can be measured through specific indicators such as government subsidies, tax incentives, and technology incentives.

2.2 Structural model

Structural models define causal relationships between latent variables. For example, how policy support ultimately affects the effectiveness of results translation by influencing research capacity and market demand. The specific model equation is as follows:

PS → RC → TE

PS → MD → TE

PS → CS → TE

RC → CS → TE

MD → CS → TE

2.3 Model Assumptions

H1: Policy support (PS) has a significant positive impact on research capability (RC).

H2: Policy support (PS) has a significant positive impact on market demand (MD).

H3: Policy support (PS) has a significant positive impact on scientific and technological advisory services (CS).

H4: Research capability (RC) has a significant positive impact on scientific and technological advisory services (CS).

H5: Market demand (MD) has a significant positive impact on scientific and technological consulting services (CS).

H6: Scientific and technological consulting service (CS) has a significant positive impact on results conversion effect (TE).

H7: Policy support (PS) indirectly influences the results translation effect (TE) through research capacity (RC) and market demand (MD).

2.4 Model verification and analysis

In order to verify the above model and hypothesis, this paper uses the questionnaire survey data for empirical analysis. First of all, SPSS software was used for descriptive statistical analysis of the collected data to understand the basic situation of the data. Descriptive statistical analysis includes calculating the mean, standard deviation, skewness and kurtosis of each variable to evaluate the distribution characteristics and rationality of the data. Secondly, AMOS 23.0 software is used to construct structural equation model (SEM) to estimate and test the path relationship between variables.

2.5 Data analysis process

Descriptive statistical analysis: Analyze the mean, standard deviation, skewness and kurtosis of each observed variable, and check the basic characteristics of the data.

Reliability and validity analysis: Cronbach's Alpha was used to test the reliability of the questionnaire, and confirmatory factor analysis (CFA) was used to test the validity of the scale.

Structural equation model (SEM) analysis: Construct SEM model, estimate path coefficient, and test model fit.

2.6 Model fit evaluation

In order to evaluate the fit degree of the model, the following indexes are used in this paper:

Chi-square test (χ^2) : test the fit between the model and the actual data. The smaller the chi-square value, the better the fit of the model.

Comparative fit Index (CFI) : The closer the CFI value is to 1, the better the model fit.

Value added Fitting Index (IFI) : The closer the IFI value is to 1, the better the model fit.

Normalized residual root mean square (SRMR) : The smaller the SRMR value, the better the model fit.

Approximate root mean square error (RMSEA) : The smaller the RMSEA value, the better the model fit.

3 Results and discussion

3.1 Descriptive statistical analysis results

Through descriptive statistical analysis, we can initially understand the basic characteristics of the survey data. For example, the mean and standard deviation of each variable reflect respondents'

overall evaluation of policy support, scientific research capabilities, market demand, scientific and technological consulting services, and results transformation effects.

3.2 Reliability and validity analysis results

Reliability analysis results showed that Cronbach's Alpha values of all variables were greater than 0.7, indicating that the questionnaire had high internal consistency. The validity analysis results showed that the scale had good validity, and the factor load between each latent variable and its corresponding observed variable was significant.

3.3 Structural equation model analysis results

Through SEM analysis, the path coefficient and its significance level between the variables can be obtained. Specific results are as follows:

The path coefficient of policy support (PS) on research capability (RC) was 0.45, and the significant level was $p<0.01$.

The path coefficient of policy support (PS) to market demand (MD) is 0.37, and the significant level is $p<0.01$.

The path coefficient of policy support (PS) to scientific and technological advisory service (CS) was 0.29, and the significance level was $p<0.01$.

The path coefficient of RC to CS was 0.31, and the significance level was $p<0.01$.

The path coefficient of market demand (MD) to scientific and technological consulting service (CS) is 0.27, and the significance level is $p<0.01$.

The path coefficient of scientific and technological consulting service (CS) on results transformation effect (TE) was 0.42, and the significance level was $p<0.01$.

3.4 Discussion

Through the analysis of the above results, we can find out the influence path and mechanism of policy support, scientific research ability, market demand and scientific and technological consulting service on the transformation of agricultural scientific and technological achievements in Yunnan province. Policy support indirectly contributes to the translation of results by enhancing research capacity and market demand, and promoting scientific and technological advisory services. Scientific research ability and market demand directly affect the results transformation effect through scientific and technological consulting services. The results showed that policy support and scientific and technological consulting service played an important intermediary role in the transformation of agricultural scientific and technological achievements in Yunnan Province. The government should strengthen the policy support for the transformation of agricultural scientific and technological achievements, enhance the scientific research capacity of scientific research institutions, meet the market demand, and strengthen the specialization and standardization of scientific and technological consulting services to promote the effective transformation of agricultural scientific and technological achievements.

4 Closing remarks

To sum up, policy support, scientific research capacity, market demand and scientific and technological consulting services all play key roles in the transformation of agricultural scientific and technological achievements in Yunnan Province. Policy support indirectly promotes the

transformation of results through various ways, and scientific research capacity and market demand directly affect the transformation of results through scientific and technological consulting services. The government should increase policy support, enhance the scientific research capacity of scientific research institutions, meet the market demand, and strengthen the specialization and standardization of scientific and technological consulting services, so as to promote the effective transformation of agricultural scientific and technological achievements and provide strong support for agricultural modernization and rural economic development in Yunnan Province.

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