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Recognizing the Challenges Facing the Commercialization of Agricultural Research (From The Perspective of the Agricultural Bank Staff)

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Abstract

Despite many decades of intensive research by universities and other research centers in the public and private sectors that could improve finance and monetary applications in agriculture activities, there has as yet not been any brilliant transforming commercialization. As the objective, Commercialization barriers causing slow market growth and poor acceptance of agriculture research in Iran are discussed here. The study's population consists of Qom Keshavarzi Bank employees. The sampling method is proportional classification, and a questionnaire is a research tool. The validity of the questionnaire was confirmed by the ideas of the specialists' panel while its reliability was supported by using Cronbach's alpha ratio with an internal correlation coefficient of 0.79. Descriptive and deductive methods were used to analyze information. SPSS and LISREL software packages were used for statistical analyses. Findings indicate that the research theoretical model on the direct and negative impact of such challenges as lack of knowledge on commercialization, policy making, lack of organs that support commercialization, commercialization negligence, and research structure on latent variable of agricultural research findings is confirmed by high fitness which indicates right identification of affecting challenges on research commercialization and needs to find solution for facilitating the modification of such challenges.

Keywords:
Challenge recognition, Commercialization, Agricultural researches

1. Introduction

Transitioning from subsistence agriculture to commercial agriculture is a key element for the economic development of low-income countries. Using the relative benefits of agricultural business increases, commerce and productivity, leading to a cycle of increased household income, improved consumption, food security, and nutrition in rural household economics, thus growth and improved welfare at the national level (Carletto et al., 2017). Also, development of modern agricultural systems based on the scientific management of water and fertilizers has also played a major role in supply of crops and increasing farmers' income (Tian et al., 2016). The study conducted by (Gholami & Dehyouri, 2018; Matenga & Hichaambwa, 2017) supports the hypothesis that the planting model has an economic expression that has been reduced to surrounding communities and local economies. Also, the commercial agricultural model, based on large-scale elite commercial agriculture, provides benefits to the surrounding area through employment and local economic communication. The study conducted by (Hajimirrahimi & Valadan, 2020) showed that the business process consists of seven stages of forming research and technology ideas, evaluation of

research and technology ideas, formulation of research and technology ideas, implementation of research and technology ideas, providing the conditions for commercialization of research findings, implementation and management of the commercialization plans of research findings and maturity and evolution of the process of commercialization of research findings. Designing and establishing the knowledge commercialization process is done by defining the knowledge transfer requirements, including formulation of bylaws, ensuring the quality of projects, financing, legislation, and developing culture (Hasangholipour et al., 2011). Agricultural studies have undergone various developments so far. At the present time, commercialization of agricultural research findings, especially academic agricultural research, has been interested by researchers to make university involved in the economic development, especially knowledge-based and entrepreneurial economics (Hajimirrahimi & Valadan, 2020).

In other definition, technology commercialization is a process in which industry and profession find a way to use simpler engineering and scientific advances of technology to meet market demand. In other words, the commercialization of technology means developing the design and idea to market quickly and optimally in today's business environment. This process continues with the stages of presenting an idea, designing, expanding, increasing the rate of production, marketing and subsequent efforts to develop the product (Kumar & Jain, 2003). Saffari et al., 2022) conducted a study entitled "Strategic Analysis of Entrepreneur University of Applied Sciences and Technology in Agricultural Sector". Academic agricultural research, like other subdivisions of Iran's research system, is affected by factors influencing the commercialization of research findings. Due to relatively new approach of domestic universities to the commercialization issue, there is no clear understanding of the importance and necessity of commercialization among agricultural research authorities in many cases and no appropriate and well-organized executive mechanism and organizational process and structure has been defined for commercializing of academic agricultural research.

Poorzabolzade et al., (2017) Discovering compatible technology with process of producing crops, supplying enough budget and low-interest loan for buying required equipment for the farmers and experts are among the most important economic factors for the application of precision agriculture system.

Ansari et al., (2016) conducted a research to analyze the challenges of commercialization of research from the viewpoint of faculty members of Iranian agricultural faculties. The results of research showed that in ranking the challenges of commercialization from the viewpoint of the faculty members, educational, informing, infrastructural-supportive challenges ranked the highest. Also, the results of exploratory factor analysis showed that challenges of commercialization of research findings of agriculture faculties include seven distinct factors of infrastructure-supportive, educational, communication, technical-specialized, organizational, and financial and policy making. These factors account for 57.40% of the total variance of the variables. Malek (2012) have shown in their research that commercialization of research as the last bottleneck of entrepreneurship plays a significant role in transforming research ideas into innovative outputs that are often indicators of agricultural technology management. The major weakness of the agricultural technology management system in the commercialization process in Iran is mainly related to the planning processes manifested in the form of drawing the agricultural technology maps and technology evaluation). Patrick Chuks (2013) state that commercialization and privatization make it possible for more farmers to be reached. Also, Patrick Chuks (2012) believed that not providing an opportunity for neglected areas of agaric production to be attended to is one of the challenges facing commercialization.

Fernández Pinto (2020) conducted a study to analyze the challenges of commercialization of human science research and present a grounded theory. The grounded theory was used to analyze the data and make a conclusion from the research findings. In other words, in this study, a theory is presented rather than testing the theory and confirming or rejecting it. The main findings of the mentioned research using the grounded theory included scientific identity of human sciences, policy making, researchers' incapacity, misunderstanding of commercialization, and research structure. The results of a study conducted by Hasangholipour et al., (2011) showed that the most important barriers to knowledge commercialization at university were opposition to corporate thinking at university, distrust between university and industry, bureaucracy and lack of management system flexibility, poor rules and regulations, providing non-practical training and low research head. In another research, he reported the main barriers to commercialization, including lack of competition at university environment, a negative attitude to corporate thinking at the university, the inefficiency of rules and regulations, the weakness of the university education system, distrust between university and industry, financial problems, the lack of skilled manpower and knowledge, lack of knowledge on real-world environment and the lack of a research strategic document.

Therefore, due to necessity of developing science and technology in the economic cycle and directing the research in the country towards transformation of research ideas and results into generation of wealth, it is necessary to take actions in the field of supporting knowledge-based and technology-generating companies and take steps in this area by targeted development of technology appropriate to potential capabilities and facilities of the country (Jahed & Arasteh, 2013).

The literature review has provided a brief overview of the research systems and a synthesis of good practices and policy issues for developing these systems including the involvement of universities and the private sector. This paper tries to provide a brief review of the most highlighted challenges and trends in bank agricultural research systems. We also focus on key challenges that make weak public research institutions, research management, client orientation, and funding. Finally, by recognizing of challenges, we discuss how Keshavarzi Bank as the most related funding entity could be implicated in its ongoing efforts to strengthen agricultural research systems.

2. Methodology

In terms of the direction of the research, it is considered an applied type of research and it has been done with the causal-relational method and covariance-variance matrix analysis. This research is a field and non-experimental type of research in terms of the degree of variable control. Due to providing implementable agricultural research projects for many years by Keshavarizi Bank and the knowledge of the bank employees on the benefits of research projects and their commercialization, the statistical population of the present study was selected among the employees of Keshavarzi Bank of Qom province. There are 25 branches of Keshavarzi Bank with a total of 186 employees in Qom. Due to the low number of agricultural commercialization research by the Agricultural Bank of Qom province compared to other central provinces of Iran, it seemed that it could be a suitable place to examine the challenges of commercialization. In this research, proportional stratified sampling method was used according to the number of employees in each branch. A questionnaire was designed according to the literature and theoretical foundations and considering the research objectives. The opinions of the relevant advisors, supervisors, and experts were used to assess the validity of the questions and their consistency with the research population culture. The reliability of the questionnaire was confirmed by using Cronbach's alpha coefficient (0.8) through SPSS software. For data processing, SPSS version 18 software was used in the descriptive part and Lisrel version 8/54 was used in the analytical part for confirmatory factor analysis (CFA). It should be noted that the validation of the research model was done with the structural equation model (SEM).

3. Results and discussion

In order to examine the direct and indirect relationship between research variables and better understanding of equation relationships between research variables, a combination of confirmatory factor analysis and structural equations was used. Based on Table 1, the value of KMO index is 0.859 (greater than 0.7), so sample number (number of respondents) is adequate for factor analysis. Also, the significance value of Bartlett test is less than 0.05, indicating that factor analysis is appropriate for identifying the structure of the factor model**.**

Correlation test

In order to test the significant relationship between the research variables, according to the nature of the variables, the identified challenges include lack of knowledge about commercialization, policy making, lack of institutions supporting commercialization, commercial awareness, the nature of research as independent variables and commercialization of agricultural research as the dependent variable was used Spearman test.

Based on Table 2, the significance level of the test is 0.000, which is less than 0.01 (the research error rate (is 0.01). Therefore, the null hypothesis is rejected and with 99% confidence, it can be said that there is a significant relationship between independent and dependent variables. According to the positive value of the correlation coefficient, it can be said there is a positive correlation between variables.

Assessing construct validity of the model of measuring the challenges of commercialization

According to Figure 1 and based on the output of LISREL software for the variable of lack of knowledge about commercialization (x_1), Agricultural research being theory (0.82), could distribute the variance of lack of knowledge about commercialization more than other questions. For the policy making variable (x_2), (Weakness in communication between agricultural research and application centers) (0.83) could distribute the policy making variance more than the other questions. For the variable of lack institutions to support commercialization (x_3), (Lack of researcher motivation in agricultural research) (0.83) could distribute the variance of lack of institutions to support

commercialization more than other questions. For the variable of misunderstanding of commercialization, (Contradiction between commercialization and bank duties) (0.86) could distribute the variable of misunderstanding of commercialization more than other questions. For the nature of research variable (x_5), (The distance between theory and practice in agricultural research) (0.81) could distribute the variance of nature of research more than the other questions (Figure 1).

The next output (Figure 2) shows the significance of the coefficients and parameters obtained from the model of measuring the challenges of commercialization. The significance value of them is out of range (-1.96, 1.96). These numbers indicate the model is appropriate. In other words, each item is significant in terms of its own factors or variables.

Table 1. Results of sampling adequacy test

Bartlett test		
Significance level	Chi-square value	KMO Statistic value
0.000	3527.88	0.859

Table 2. Results of testing the commercialization variable correlation with other variables

	Commercialization	
Commercialization challenges	Correlation coefficient	Significance level
Lack of knowledge about commercialization	0.63**	0.000
Policy making	0.71**	0.000
Lack of institutions to support commercialization	0.54**	0.000
Misunderstanding of commercialization	0.38**	0.000
Nature of research	0.67**	0.000

** At the significant level of 0.01

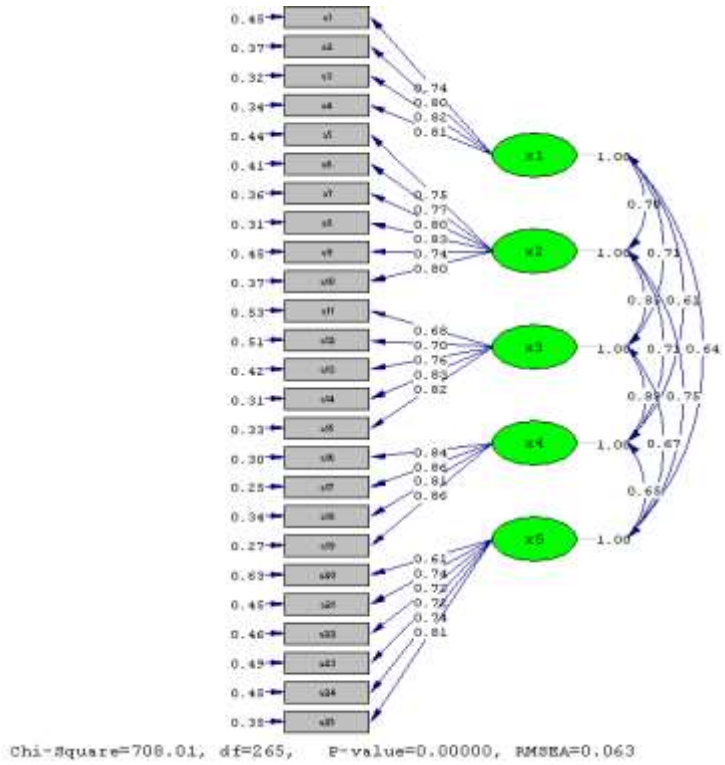

Figure 1. First-order confirmatory factor analysis of commercialization challenges in standard estimation mode

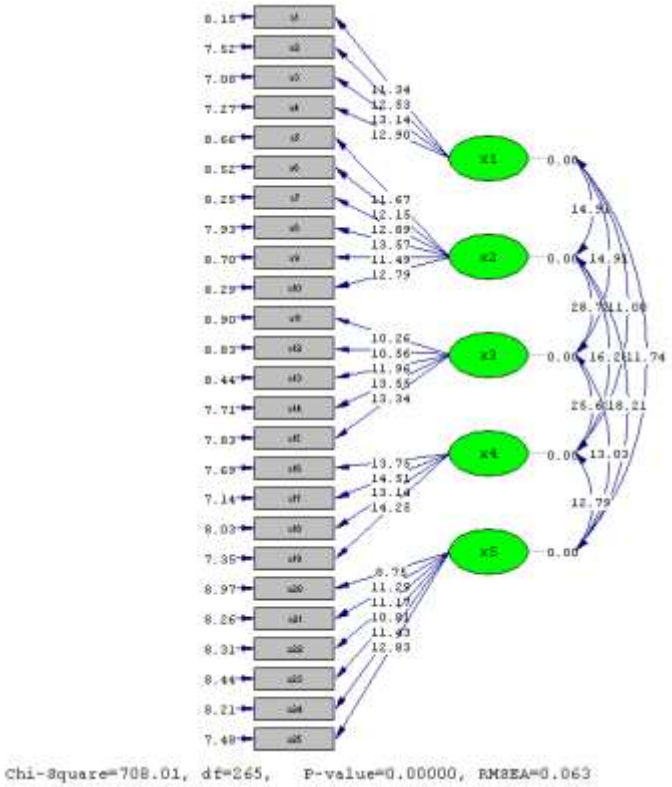

Figure 2. First-order confirmatory factor analysis of model of commercialization challenges in the significance of parameters mode

Assessing the construct validity of model of measuring the commercialization variable

Figure 3 shows the model of commercialization variable in the standard coefficient estimation mode with an output of RMSEA = 0.059 for the model. The lower the value of the RMSEA index, the more appropriate the model will be. For the commercialization variable, Question 1 (0.77) could distribute the variance of commercialization more than other questions. This item has more effect on the mentioned factor compared to other items**.**

The next output (Figure 4) shows the significant part of the coefficients and parameters obtained from the model of measuring commercialization variable. Their significance value is out of range (-1.96, 1.96). The significance of these numbers indicates that the model is appropriate**.**

Assessing the construct validity of the final model

Figure 5 shows the final model in standard estimation mode with an output of RMSEA = 0.058 for the model. Measurement models in the standard estimation mode show the effect of each of the variables or items on the distribution of variance of the variable scores or the main factor. As seen, the path model consists of 6 latent variables and 30 observed variables. The latent variables are in turn divided into two types of endogenous and exogenous variables. In this model, the variables of lack of knowledge about commercialization (x_1), policy making (x_2), lack of institutions to support commercialization (x_3), misunderstanding of commercialization (x_4), and nature of research (x_5) are exogenous variables and commercialization variable (y) is an endogenous variable**.**

Positive coefficients indicate direct correlation and negative coefficients indicate indirect relationship between the variables. The level of the effects of lack of knowledge about commercialization (x_1), policy making (x_2), lack of institutions to support commercialization (x_3), misunderstanding of commercialization (x_4), nature of research (x_5) on the challenge of commercialization are 0.73, 0.84, 0.62, 0.41, and 0.74, respectively. Due to positive sign of coefficients (β), it can be stated that the variables of lack of knowledge about commercialization, policy making, lack of institutions to support commercialization, misunderstanding of commercialization, and nature of research have a direct and positive impact on the challenge of commercialization**.**

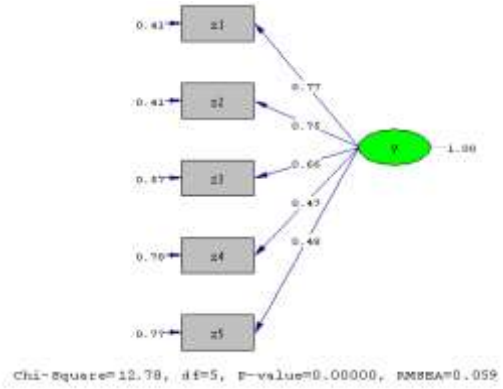

Figure 3. First-order confirmatory factor analysis of the model of commercialization variable in standard estimation mode

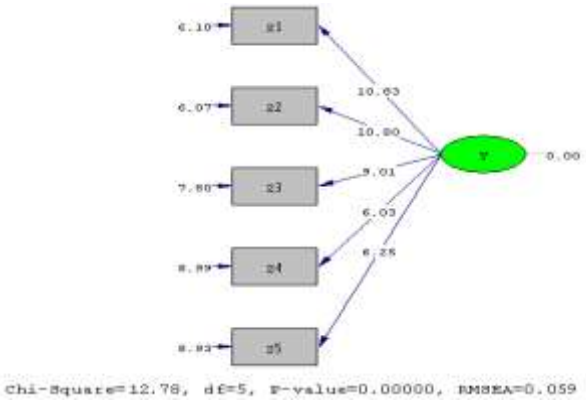

Figure 4. First-order confirmatory factor analysis of model of commercialization variable in the significance of parameters mode

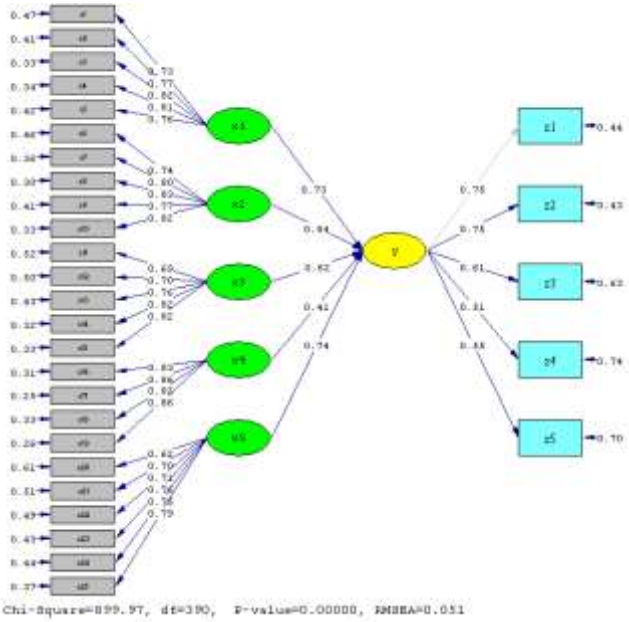

Figure 5. Second-order confirmatory factor analysis of the final model in standard estimation mode

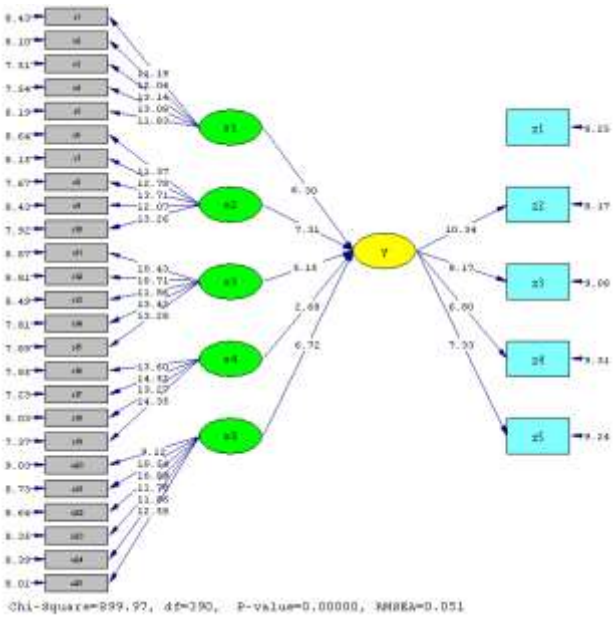

Figure 6. Second-order confirmatory factor analysis of the final model in the parameter significance mode

Figure 6 shows the significant part of the coefficients and parameters obtained from the model**.** If the obtained t is out of the range (-1.96, 1.96), it can be stated that relationships are significant.

Lack of knowledge about commercialization: x_1, policy making: x_2, lack of institutions to support commercialization: x_3, misunderstanding of commercialization: x_4, nature of research: x_5 and Z: items related to commercialization variable

According to Figure 6, t-statistic value for all variables is out of range (-1.96, 1.96), so it can be stated that all relationships are significant at the 95% confidence level.

Discussion

Based on the present study and comparing it with some other studies, we obtained the following results**:**

The results showed that there was a significant relationship between lack of knowledge about commercialization, policy making, lack of institutions to support commercialization, misunderstanding of commercialization, and the nature of research and commercialization of agricultural research and all of the factors were challenges that had a direct impact on the commercialization of the research. (Fernández Pinto, 2020) conducted a study to analyze the challenges of commercialization of human science research and present a grounded theory. The grounded theory was used to analyze the data and make a conclusion from the research findings. In other words, in this study, a theory is presented rather than testing the theory and confirming or rejecting it. The main findings of the mentioned research using the grounded theory included scientific identity of human sciences, policy making, researchers' incapacity, misunderstanding of commercialization, and research structure.

Agricultural research, like other subdivisions of Iran's research system, is affected by factors influencing the commercialization of research findings. Due to relatively new approach of domestic universities to commercialization, there is no clear understanding of the importance and necessity of commercialization among the agricultural research authorities in many cases and no appropriate and well-organized executive mechanism and organizational process and structure has been defined for commercializing of academic agricultural research. The results of the present study are in line with those of the study conducted by (Ansari et al., 2016) under the title of "Analyzing the challenges of commercialization of research findings from the viewpoints of faculty members of Iranian agricultural faculties**.** The results of research showed that in ranking the challenges of commercialization from the viewpoint of the faculty members, educational, informing, and infrastructural- supportive challenges ranked

the highest. Also, the results of exploratory factor analysis showed that challenges of commercialization of research findings of agriculture faculties include seven distinct factors of infrastructure-supportive, educational, communication, technical-specialized, organizational, and financial and policy making. These factors account for 57.40% of the total variance of the variables.

The results of a study conducted by Hasangholipour et al. (2011) show that the most important barriers to knowledge commercialization at university are opposition to corporate thinking at university, distrust between university and industry, bureaucracy and lack of management system flexibility, poor rules and regulations, providing non-practical training and low research head. In other research, he reported the main barriers to commercialization, including lack of competition at university environment, a negative attitude to corporate thinking at the university, the inefficiency of rules and regulations, the weakness of the university education system, distrust between university and industry, financial problems, the lack of skilled manpower and knowledge, lack of knowledge on real-world environment and the lack of a research strategic document. Based on the results of the present study, it is recommended that government and bank officials provide the necessary training for managers and employees of Keshavarzi banks, (Arfaee et al., 2021)'s study reveals this notion could be improved Organizational Intelligence.

Keswani et al., (2019) state that another constraint to enhancing research and development and the use of new agricultural research is the high costs for the registration of innovation.

Also, (Min et al., 2019) suggest that the effects of company absorptive capacity and partnership strength with U&PRIs on the successful commercialization of transferred technologies are more complex than expected. The results of the present study are somewhat consistent with those of the research conducted by (Howells & McKinlay, 1999) who reported that the major challenges of commercialization of research findings included lack of financial resources with regard to commercialization, lack of available financial resources for staging and risk-taking investment, the need to improve intellectual property management methods in joint research with industry and low interactions with regional technology supporting organizations.

4. Conclusion and Recommendation

Operationalization of research and technology ideas requires the provision and allocation of resources needed for research by the responsible institutions, creative and efficient management of research projects, allocation of credit for specific planning, appropriate formulation of research findings, assessment of the scale, life cycle and market of technology, development of technology package, finance/technical support, and predicting the methods of optimal absorption of the resources needed for the production of the technology package.

In order to lay the groundwork for the commercialization of research findings, especially in institutions such as banks, research findings should have the ability to reach knowledge and technology, willingness and cooperation in science and technology parks and technology markets, setting and applying the necessary rules and regulations, and pricing. And evaluate the knowledge and technology obtained in terms of added value, carry out developmental research to eliminate the shortcomings of small-scale experiments, and investigate the fields of further application of research findings.

The implementation and management of the commercialization plan of the research findings require the formulation and implementation of the commercialization roadmap by choosing the appropriate method, obtaining the agreement of the research team members and other parties for the commercialization of the technology, searching for a distribution department and marketing the technology, and adjusting and The contract between the parties is in the process of commercialization of research findings.

In order to institutionalize and evolve the process of commercialization, the findings need to be distributed fairly.

The evaluation of the consequence of commercialization for the development of the agricultural sector is the satisfaction and perspective of consumers and documentation (recording of statistics, information and experiences).

Laying the groundwork for the implementation of these policies, especially some operational measures considered, cannot be implemented alone and requires the development of the agricultural sector and the entrepreneurship and technology space in this sector through strategic policymaking and multilateral cooperation of stakeholders .

In this regard, it is possible to mention the development of a road map for commercialization in the agricultural sector based on the development of research and technology networks in the agricultural sector, monitoring and forecasting technological advances, business development in the agricultural sector, and improving the rate of entrepreneurship .

For example through banks' support and cooperation in private consulting and promotional service companies, as well as the formation of knowledge-based businesses to attract and commercially exploit research findings.

It is recommended that future research focused on the establishment's possibility of an effective organizational R&D sector. Also researchers could try to recognize what should be needed to support facilities in storage, business

management, capacity building, packing, and processing. Furthermore, could the interlocked transaction institutional arrangement model apply to keshavarsi bank?

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