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Identifying the Barriers of Science and Technology Parks (STPs) in the Development of Agricultural Technology in Iran

Homyoon Dinarany[1], Tahmasb Maghsoudi[1*], Saeed Mohammadzadeh[2], Azadeh Noorollah Noorivandi[1]
[1]*Department of Agricultural Extension and Education, Shoushtar Branch, Islamic Azad University, Shoushtar, Iran*
[2]*Department of Agricultural Extension and Education, Agricultural Sciences and Natural Resources University of Khuzestan, MollaSani, Iran*
[*]*Corresponding Author, Email: tahmasbmaghsoodi12345@gmail.com*

Abstract

The main purpose of the current research was to identify the barriers of science and technology parks (STPs) in the development of agricultural technology in Iran. The statistical population of this research were 824 managers of agricultural companies, and 180 people were selected as a sample using Cochran's formula and selected by stratified random sampling. The validity of the research tool was determined through a panel of experts and its reliability was determined through the calculation of Cronbach's alpha coefficient. This coefficient was higher than 0.7 for all sections. In order to measure the barriers of STPs in the development of agricultural technology, 26 items were proposed and evaluated based on manager's views. The obtained results show that seven factors explain 65.697 percent of the barriers of STPs in the development of agricultural technology. The first factor with eigenvalue of 8.671 and explained about 12.568% of the variance related to barriers, was named as "organizational barriers ". The next barriers were named as "economic and financial barriers", weakness in risk management", "Management barriers", "social and cultural barriers", "scientific barriers" and "attitudinal barriers", were named.

Keywords:
Barriers, Science and Technology Parks (STPs), Agricultural Technology, Iran

1. Introduction

Science and technology parks (STPs) are one of the most important means of achieving a knowledge-based economy, and its main goal is to help innovative entrepreneurs to create companies and businesses. So that they can succeed and compete in the national and international free markets with minimal risk. Agriculture is one of the important economic sectors of the country, which requires the development of technology to overcome the existing challenges. Considering the small number of agricultural knowledge-based companies and enterprises, it is necessary to help the growth and development of these units by creating a support structure. The agricultural science and technology park can become the basis for this by using the existing capacities (Jamshidi et al., 2021). An Investigation of STPs in technology development in different countries show a positive impact on development is technology. Factors influencing on the development of technology parks can be considerable help in the creation of parks may be appropriate (Davoodi et al., 2014). The Agricultural Science and Technology Park plays a vital and essential role in promoting and improving the structure of agriculture, fostering leading industries, improving the technological innovation capability of agricultural enterprises, developing technology and increasing the income generation of farmers.

Zhang (2012) conducted a research on the comprehensive development model of advanced agricultural STPs for knowledge-based and agricultural research enterprises, which include scientific and technological innovation, technology promotion, technology development, science education, rural tourism, and agriculture and business. He expressed the construction. Zhou Jian et al. (2016) believe that agricultural STPs have barriers and problems such as insufficient talent, insufficient funding and insufficient linkage mechanism with farmers' interests, which makes the park's innovation cluster effect. Obviously, the economic benefits should be improved. Yang et al., (2018) explained

innovative ability is an important indicator for judging the effectiveness of the national agricultural science and technology park construction. It is necessary to promote the improvement of innovation capabilities by promoting the synergy and innovation of agricultural science and technology in the park, encouraging the park to construct agricultural technology business incubators, and building and improving innovation platforms. Agricultural STPs are important measures to promote rural rejuvenation, realize agricultural modernization, and speed up the construction of a new countryside (Jamshidi et al., 2021).

The Science Technology Park (STP) is primarily designed to create links between business, academia and government in order to initiate the development of new technologies, including their commercialization. The most important barriers in the way of their activities are high bureaucracy, weak networking and low entrepreneurial culture (Dhewanto et al., 2016). According to the results of Pourfateh et al., (2017), there is a need to focus on improvement of the relationship between agricultural faculties and STPs. Therefore, it is recommended to locate Science and Technology Park near the university or research centers. In addition, because of financial shortage, it is necessary to meet the physical facilities managers should do innovative solutions like other incubators to provide flexible space, the allocation of shared space and facilities and rental rates up allowed to renew the lease with regard to optimize the exploitation of their resources. Incubators can communicate with institutions such as universities, and research institutes and the private sector provide access to some manufacturing facilities such as workshops, laboratories and research, and development for entrepreneurs. This relationship requires a mutual benefit for both parties. According to research findings, since access to the skills and expertise is a priority to improve quality of business, the establishment of a network of information and transfer of experience and a network of business sponsors can increase the success rate of knowledge-based enterprise.

Guadix et al., (2016) explained STPs are of great importance in the business context of the region in which they carry out their activity. They are the main mechanisms of public and private initiatives for the promotion of research, development and innovation, and technology transfer. The main goal of this type of institutions is not a purely economic benefit, but also social and cultural, which makes them an appropriate investment from the public institutions' viewpoint. They promote the creation of companies and agreements with universities and research centers, generate employment, and attract technology-based companies. Therefore, they require in-detail assessment to understand their operation to generate action plans and models that new parks or those who are still in their initial growth phase may follow.

Numerous empirical studies show that locating in a park can be beneficial for companies for many reasons, such as increased external interactions and collaboration, which may lead to positive effects on company production, improved research and public performance, and support in patent application and technology development (Sudrajat and Syarif, 2016). Addressing the existing barriers and identifying the factors that make STPs attractive to companies is essential for better performance and effeciency of STPs and companies. This is not only important for scaffolding new STPs, but also helps to form highly motivated companies to be part of STPs. Considering attractive factors for companies in STP will obviously gather more motivated companies and ensure their success. Highlighting these factors will help local and national governments to plan and provide support for STPs needs as well (Jamshidi et al., 2021). STPs and Technology Business Incubators (TBIs) are globally considered as effective centers to achieve development goals and promotion of R&D plans. These centers not only bridge the gap between universities and industry, but also facilitate the transfer of technology and knowledge by employing alumni population and accelerate the movement towards knowledge-based economic growth. On the other hand, the possibility of international communication between STPs and TBIs provides a favorable situation for scientific & technological cooperation between them and other similar centers and technology companies. Therefore, providing a comprehensive national picture of the overall situation of the STPs and TBIs in line with the policy making of technology in Islamic Republic of IRAN is important (Rezaeisadrabadi, 2021).

2. Materials and Methods

The main purpose of the research was to identify the barriers of STPs in the development of agricultural technology in Iran. The research method is a correlational survey. This research is of applied type. The statistical population of this research is 824 managers of agricultural companies, of which 90 were selected using Cochran's formula as a sample and selected by stratified random sampling. The validity of the research tool was determined through a panel of experts and its reliability was determined through the calculation of Cronbach's alpha coefficient. This coefficient was higher than 0.7 for all grades. Factor analysis technique has been used to identify barriers. SPSS 22 software was used for data analysis.

3. Results and Discussion

3.1 Characteristics of respondents

For investigation of the personal and occupational attributes, some variables such as age, working experience, major, education level, number of scientific articles, etc., were investigated. The results are provided in Table 1 in detail.

3.2 Identifying the barriers of STPs in the development of agricultural technology

The results obtained from the identification and classification of the barriers to the role of STPs in the development of agricultural technology show that the data is suitable for factor analysis. The value of KMO coefficient is greater than 0.7 and Bartlett's test is also significant, the results are shown in table 2.

Table 1. Description of the personal and occupational attributes of the respondents.

Variable	Items	Frequency	Authentic percentage	Cumulative percentage	Descriptive statistics
Age	Under 40	22	24.44	24.44	Mean=44.26
	40-50	36	40	64.44	Median=44
	50-60	22	24.44	88.89	Sd=9.25
	Above 60	10	11.11	100	
	Total	90	100		
Education level	Master's degree	10	11.11	11.11	Mode=Ph.D.
	Ph.D.	80	88.89	100	
	Total	90	100		
Managerial position	No	15	16.67	-	Mode=Yes
	Yes	75	83.33	-	
	Total			-	
Major	Extension	7	7.78	-	Mode= Forestry
	Economy	4	4.44	-	
	Farming	9	10.00	-	
	Horticulture	10	11.11	-	
	Machinery	6	6.67	-	
	Irrigation	8	8.89	-	
	Wood and paper	5	5.56	-	
	Medicinal plant	8	8.89	-	
	Fisheries	7	7.78	-	
	Forestry	12	13.33	-	
	Grassland	3	3.33	-	
	Soil science	4	4.44	-	
	Animal husbandry	7	7.78	-	
	Total	90	100	-	
Managerial experience	Less than 5 years	29	32.22	32.22	Mean=8.25
	50-10 years	25	27.78	60	Sd=7.2
	10-15 years	18	20	80	
	Above 15 years	10	11.11	91.11	
	No response	8	8.89	100	
	Total	90	100		

Table 2. The value obtained from the KMO coefficient and Bartlett's test

Test	Amount	Sig
Bartlett	1894.79	0.000
KMO	0.608	

The obtained results show that seven factors explain 65.697 percent of the barriers to the role of STPs (Table 3). The first factor with a specific value of 8.671 explains about 12.568 percent of the variance related to barriers and is named as the organizational barriers.

This factor emphasizes that the most important variables that hinders the role of STPs in technology development are based on little attention to the agricultural sector in the structure of scientific parks, absence of agricultural experts in the structure of STPs, lack of attention to technological needs, structural problems of commercialization, facility barriers for technology development, weak adherence of the extension sector to education and research, low attention to the development of technology in the agricultural sector (Table 4).

The second factor, which is named as the economic and financial barriers factor, explains about 10.791% of the variance related to the barriers. In this factor, there are components such as lack of financial support for agricultural knowledge-based companies, economic weakness of agricultural knowledge-based companies, low investment in technology development in the agricultural sector, the attention of scientific parks to industry and agriculture, long-term economic efficiency of the agricultural sector. (Table 4). This finding is in accordance with the results of studies by Albahari et al., (2022), Han et al., (2022).

The third factor, named as weakness in risk management factor, explains 10.128% of the variance related to barriers. This factor emphasizes that investing in agricultural technologies has a high risk and due to the lack of support mechanisms, this issue is one of the main barriers in the role of STPs. In this factor, there are components such as low risk tolerance of agricultural sector operators, little attention to risk management strategies in the agricultural sector, lack of proper support to reduce the risk of adopting new technologies. (Table 4). This finding is in accordance with the results of studies by Rivera et al., (2018), Savari et al., (2023).

The fourth factor explains about 9.815% of the variance related to barriers. This factor is named as management barriers and it emphasizes managers' lack of attention to agricultural knowledge-based companies, low attention of managers to the commercialization of technology in the agricultural sector, weakness of technology in the agricultural sector (Table 4). The fifth factor, which is named as social and cultural barriers, explains 8.548% of the variance related to the barriers and emphasizes that tendency to industrial companies in STPs, lack of institutionalization of STPs in society, low teamwork culture for setting up knowledge-based companies.

This finding is in accordance with the results of studies by Retolaza et al., (2020), Torres-Pruñonosa et al., (2020). The sixth factor is named scientific barriers and it explains about 7.548% of the variance related to barriers. This factor emphasizes scientific weakness of experts in the production of agricultural technology, failure to attract elite specialists in agricultural STPs, lack of connection between companies and scientific and academic centers. Finally, the seventh factor, which is named as the attitudinal barriers, explains 6.587% of the variance of the barriers, and emphasizes the lack of trust in production technologies in companies and low attitude to the achievements of the parks (Table 4).

Table 3. Extracted factors, eigenvalue, variance percentage of eigenvalue

Factors	Eigenvalue	Variance Percentage of Eigenvalue
Organizational barriers	8.671	12.568
Economic and financial barriers	5.871	10.791
Weakness in risk management	4.894	10.128
Management barriers	4.012	9.815
Social and cultural barriers	3.854	8.548
Scientific barriers	2.951	7.548
Attitudinal barriers	1.894	6.587

Table 4. The variables related to each factor and the amount of coefficients obtained from the matrix obtained

Factor	Variable	Factor Loading
Organizational barriers	Little attention to the agricultural sector in the structure of scientific parks	0.579
	Absence of agricultural experts in the structure of scientific parks	0.673
	Lack of attention to technological needs	0.841
	Structural problems of commercialization	0.590
	Facility barriers for technology development	0.608
	Weak adherence of the extension sector to education and research	0.608
	Low attention to the development of technology in the agricultural sector	0.601
Economic and financial barriers	Lack of financial support for agricultural knowledge-based companies	0.598
	Economic weakness of agricultural knowledge-based companies	0.677
	Low investment in technology development in the agricultural sector	0.712
	The attention of scientific parks to industry and agriculture	0.609
	Long-term economic efficiency of the agricultural sector	0.712
Weakness in risk management	Low risk tolerance of agricultural sector operators	0.662
	Little attention to risk management strategies in the agricultural sector	0.664
	Lack of proper support to reduce the risk of adopting new technologies	0.609
Management barriers	Managers' lack of attention to agricultural knowledge-based companies	0.608
	Low attention of managers to the commercialization of technology in the agricultural sector	0.590
	Weakness of technology in the agricultural sector	0.608
Social and cultural barriers	Tendency to industrial companies in STPs	0.601
	Lack of institutionalization of STPs in society	0.705
	Low teamwork culture for setting up knowledge-based companies	0.673
Scientific barriers	Scientific weakness of experts in the production of agricultural technology	0.691
	Failure to attract elite specialists in agricultural STPs	0.593
	Lack of connection between companies and scientific and academic centers	0.638
Attitudinal barriers	Lack of trust in production technologies in companies	0.681
	Low attitude to the achievements of the parks	0.591

4. Conclusion and Recommendation

Based on the results, factors were identified as barriers to STPs in agricultural development. Paying attention to these barriers and trying to solve them can have an effective role in improving the development of technology in the agricultural sector. Based on the results, there are many organizational barriers in this regard that should be solved. Increasing attention to the agricultural sector in the structure of science parks, the presence of agricultural experts in the structure of science parks, and paying attention to the needs of technology in the agriculture sector are among the solutions that can help planners in solving this barrier. The next items are the economic and financial issues that were raised as a barrier to STPs for the development of technology in the agricultural sector. Based on the results of the research, to remove the mentioned barrier, it is suggested that financial support for agricultural knowledge-based companies, improvement of the economic situation of agricultural knowledge-based companies, appropriate investment in the development of technology in the agricultural sector, the attention of STPs to agriculture and increase The efficiency of the agricultural sector should be considered. Also, one of the other barriers was the weakness in risk management, which is suggested by using strategies to increase risk tolerance among the operators of the agricultural sector, increasing attention to risk management strategies in the agricultural sector, appropriate support to reduce the risk of accepting new technologies compared to remove the mentioned barrier. The fifth barrier was the social and cultural barrier, and it emphasizes that in order to solve this barrier, the trend towards agricultural companies in STPs should be increased, and the institutionalization of STPs in the society should be taken into consideration, and the teamwork culture should be strengthened. to be The sixth barrier is called scientific barrier. This factor emphasizes the scientific weakness of experts in the production of agricultural technology, the lack of attracting elite experts in agricultural STPs, the lack of connection between companies and academic and scientific centers, and it is recommended that these issues should be resolved. Finally, the seventh factor named as attitudinal barriers. To solve it, it is recommended to strengthen the trust in production technologies in companies and the attitude towards the achievements of the parks.

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