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Identifying and Ranking the Influential Economic and Financial Factors in the Research and Development of Agricultural Institutions

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Abstract

Improving agricultural economy necessitates identifying influential factors impacting it. Therefore, the identification and ranking of influential economic and financial factors on research and development in agricultural institutions has been carried out using the Grounded Theory approach.

In this Study, influential economic and financial factors are identified using Grounded Theory and MAXQDA 2018 software, focusing on the statistical population of agricultural research professionals employed in agricultural research institutions. The findings indicate that the effectiveness of research budgets distribution, monetization of applied research, market research, government budget for agricultural research and development, private sector research credits, are the most impactful economic and financial factors influencing the research and development of agricultural institutions, respectively. The limitation of this research can be pointed out to the concentration of applied research in the field of agriculture in the TAT organization located in Tehran. Based on this, there may be other codes in the direction of improving the capabilities of applied research in the field of agriculture that have not been identified. The results of this research will help policy makers to know inability of applied research to solve the problems of the agricultural sector and create value in this important part of the country's economy. What was not in the previous researches and what we did in this research for the first time is that the previous researches is to identify and rank the economic and financial factors influencing the research and development of agricultural institutions.

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1. Introduction

Contrary to economists in the 1940s, contemporary economists believe that there isn't merely a conflict between the growth of agriculture and industry; instead, they can mutually support each other's growth within the course of economic development (Ahmadloo & Mehrabi, 1388). In recent years, due to challenges arising from sanctions and Iran's economic unpreparedness to counter these external threats, there has been an increased focus on concepts such as Economic Vulnerability and the factors influencing it (Ehsani et al., 2021).

In a world that emphasizing zero waste and high reliability, the production of goods necessitates a shift from skill-based processes to a scientific approach. Consequently, there exists a critical imperative for meticulous and thorough attention towards establishing an environment conducive to research and development, innovation, successful process design, production, marketing, and the advancement of novel products (Khamsa et al., 2009). In this context, research and development play a crucial role in fostering technological innovation and accelerating development. Hence, it can be asserted that research and inquiry stand as the most significant factors contributing to progress, technological development, inventions, discoveries, creativity, and innovation within any country. As industrialized and developing countries are aware of the role of research in technology creation and accelerating development, they have focused more attention on strengthening and enhancing their research sectors. Consequently, it can be stated that there is a direct correlation between the progress of the research sector and the comprehensive, sustainable acceleration of development in any country. Research should be the key tool and basis upon which decisions and actions are made. In societies with a higher number of researchers and scholars, greater scientific, social, and political advancements are made possible (Paghaleh & Shafiee-Zadeh, 2011).

On the other hand, many countries in the early stages of their growth and development have acquired the essential capital and resources for progress from the agricultural sector, enabling the development of other sectors based on this foundation (Jalai et al., 2013). The agricultural sector and its advancement through the enhancement of agricultural research systems and improved agricultural productivity hold such significance that they are highlighted in the Third and Forty-third Principles of the Constitution of the Islamic Republic of Iran. These emphasize the necessity of meeting basic needs, alleviating poverty, and addressing various forms of deprivation in nutrition, personal welfare, and societal well-being. (Constitution of the Islamic Republic of Iran). At present, three ministries—the Ministry of Agriculture Jihad, the Ministry of Industry, Mine and Trade, and the Ministry of Health and Medical Education—hold the main responsibility for ensuring societal health and food safety. Each ministry maintains its specific guidelines and regulations within this domain.

Statistics related to the monetization of industrial sectors, in both developed and developing nations, indicate that the agricultural sector is a priority for policymakers across all countries due to its impact on economic development and ensuring health. According to statistics from the Central Bank in 2019, the oil sector had the most substantial negative impact, whereas the agricultural sector had the most positive effect on Gross Domestic Product growth in 2018. At the same time, this sector holds an eight percent share of the Gross Domestic Product, approximately 40 billion dollars. According to the Parliament Research Center report (2020), the share of the agricultural sector in Iran's

economy has decreased from 26% in 1960 to less than 10% in 2018. In light of these conditions, it can be argued that the agricultural sector, during its growth and development, has redirected its labor force and capital surplus towards other sectors of the economy.

In the first five months of 2020, agricultural and food industry imports totaled 10,095 thousand tons, valued at $4,117 million. These imports constituted 73% of the total weight and 30% of the total value of the country's imports during that period (Iran Chamber of Commerce's National Agriculture and Water Strategic Research Center,2020). This amount, in comparison to the insignificant exports in this sector, demonstrates the country's negative trade balance. Specifically, the trade balance of agricultural and food industry products in the first five months of 2020 was negative 1,994 million, indicating a decrease of approximately 46% compared to the same period in the previous year. Comparing the trade balance of agricultural products before and after the Islamic Revolution reveals a consistent negative trend, despite the agricultural sector's relative advantage in producing such goods, especially horticultural products. The level of exports has been lower than imports. Amidst this, the continuous decline in the unit price (dollars per ton) of agricultural products also signifies policymakers' neglect in improving the quality of produced goods in the agricultural sector. This stands in contrast to the crucial role the agricultural sector plays in enhancing resilience against sanctions and driving the country's economic growth in the absence of oil revenues (Iran Chamber of Commerce's National Agriculture and Water Strategic Research Center,2020). Moreover, productivity promotion plays a crucial role in driving a surge in production. Emphasizing and focusing on efficiency in the agricultural production process signifies an improvement in both effectiveness and efficiency in converting production factors into products. This aspect remains particularly crucial, especially in times when the country faces resource limitations (Parliament Research Center,2020). The lack of a research approach and the shortage of applied research have been among the fundamental issues and challenges in the country. The agricultural sector also follows this principle, and the development of applied research activities has consistently been considered a crucial goal within the agricultural sector. Furthermore, research findings are not systematically applied in practical economic domains, and a culture of applying research findings in the behaviors of economic actors, agents, and decision-makers has not been established. Researchers claim that agricultural research has forgotten its mission, which is to discover answers and solutions to problems and challenges (Parliament Research Center,2020).

In previous research aimed to assess the problems and challenges within the agricultural research system, various aspects have been examined. These include problems such as inadequate research and development budgets, structural issues within the agricultural research framework, decentralized research management, their non-demand-driven nature, human resource shortages in the research sector, and challenges in promoting research outcomes. However, what hasn't been highlighted in previous research is the identification and prioritization of economic and financial factors that significantly impact the research and development activities of agricultural institutions. So, contrary to what the research has shown, the question arises: Despite policymakers being aware of agriculture's significance and the allocated budget, along with supportive policies in upstream documents, why do we witness the inability of applied research to address agricultural sector problems and create value in this crucial sector of the country's

economy? To answer this question, the current research aims to identify and rank the influential economic and financial factors on the research and development of agricultural institutions.

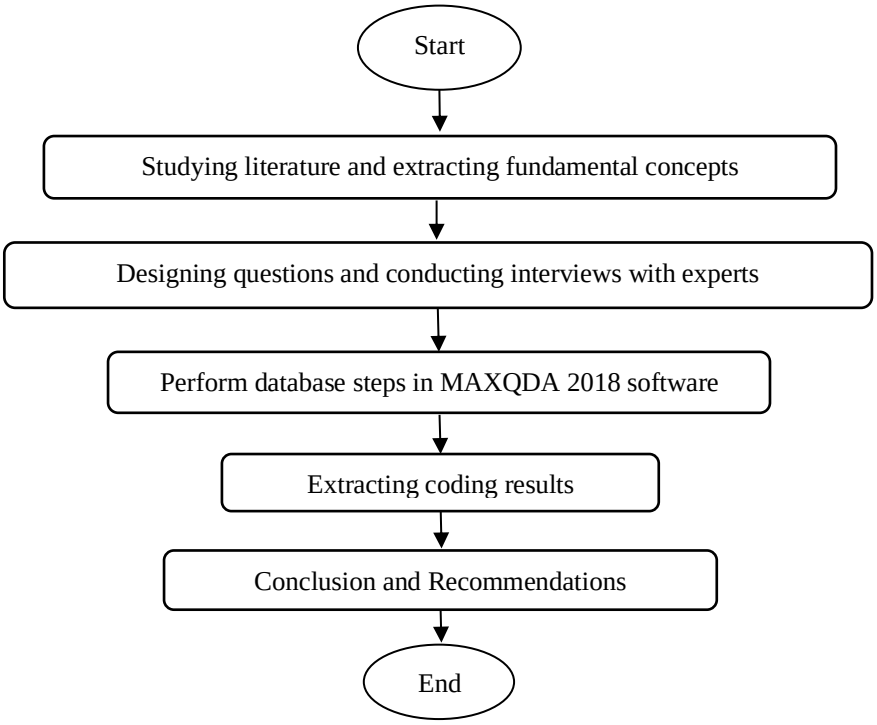

Figure 1- Executive steps of research

Theoretical Foundations

Research and development: Research and development involve the ability to direct various research endeavors and utilize the generated knowledge to enhance products, processes, or technologies (Khamese & Asari, 2021).

Agricultural research institutions: include all country-based organizations accountable for organization, coordinating, implementing, and supplying essential resources for research programs focused on achieving particular outcomes in agricultural development and the management of natural resources. From a functional perspective, the agricultural research systems can be assessed concerning the supply and demand related to specific achievements: agricultural knowledge, technology, and information (Sharifzadeh & Abdollahzadeh, 2011).

In Iran, agricultural research has undergone significant changes since the establishment of the Razi Institute in 1924. These changes encompass advancements in expanding research institutions and centers, their administration, the proliferation of agricultural higher education centers, and the structural and functional evolution of agricultural promotion as institutional

partners of research institutions and centers linked to the Agricultural Research Organization. These shifts have impacted the institutions and research centers associated with the Agricultural Research Organization. In addition to the changes in agricultural research and education, there has been a rapid increase in the number of agricultural faculties associated with the Ministry of Science, Research and Technology, Islamic Azad University, and Institutes of Higher Education.

Table 1 - Variables extracted from literature review and research studies

Row	Variables	Sources
1	Research and development expenses	Pour Ali Moghadam et al. (2019), Sabouhi Lak (2015), Noroozi Chakli et al. (2014), Sepehrdoust et al. (2012), Sharifzadeh et al. (2011), Jamali Paqaleh et al. (2011), Malek Mohammadi et al. (1998), Saruzka et al. (2017), Gomus et al. (2015), Amir et al. (2015), Biza et al. (2012), Gallard et al. (2010), Samimi et al. (2009)
2	Commercialization of technological research findings	Haji Mir Rahimi et al. (2019), Mohammad Hashemi (2019)
3	Technological financial facilities	Mohammad Hashemi (2019), Soltanizadeh et al. (2018), Sabouhi Lak (2015)
4	Investment	Laleh et al. (2019), Morid-sadat et al. (2018), Shahabadi et al. (2015), Espada et al. (2019), Yazgan et al. (2018), Saruzka et al. (2017), Rodriguez et al. (2009)
5	Laws	Pour Ali Moghadam et al. (2019), Morid-sadat et al. (2018), Laleh (2016), Sharifzadeh et al. (2011)

2. Methodology

The aim of the study is to identify and rank the influential economic and financial factors on research and development in agricultural institutions. This research was conducted within agricultural research institutions. Therefore, the type of study is applied research, and its methodology is based on a qualitative approach. The methodology used involves employing the "Grounded Theory" approach, which utilizes inductive reasoning. The statistical population of the study encompassed agricultural research experts employed in agricultural research institutions. The interviews with the experts reached saturation by the thirteenth interview, and to ensure adequacy, interviews continued up to the seventeenth. Experts have at least 9 years of experience in agricultural research and hold a master's or doctoral degree. The qualitative approach of Grounded Theory was employed to identify factors and indicators influencing the practical research capabilities. Subsequently, the findings were analyzed using the MAXQDA 2018 software.

The continuous or constant comparison method is one of the key features of the grounded theory or data base theory approach. In this method, data collection and analysis is a simultaneous and interactive process. In this method, a constant comparison is made between words, sentences, paragraphs, codes and categories. The purpose of this task is to identify similarities and differences in the data. All interviews and observations are actually compared. This process continues until the final version of the report is completed. This is a very detailed and thorough process that involves reading and listening to tape recordings over and over again. Interaction with data enables the researcher to better understand the phenomenon under study. The database theory includes three stages of coding as follows (Barari, 1400):

- Open coding

Open coding or first-level coding was initially used to label and make sense of the data. This type of coding can be done using natural codes (in-vivo), that is, using the participant's personal words. Codes that have similar meanings are linked together and renamed to categories to achieve a more abstract meaning. In addition, the location of each category feature can be specified along a chain.

- Axial coding

After open coding, it is time for axial coding or second level coding. This process is used to communicate between categories and sub-categories and enables the emergence of a conceptual framework. Theme analysis is also considered one of the most important categories. It is created by using a special model or paradigm and by determining the causes, contexts, possibilities, contexts, correlates, interactions, consequences (Glasser 1978). At this stage, some open codes can be removed because there is no connection between them. The relationship between concepts is confirmed by the method of constant comparison, and this makes it possible to formulate the theory.

- Selective coding

According to Strauss and Corbin (1998), selective coding in grounded theory is a process that links all categories and subcategories to the main category, thus facilitating the emergence of a "storyline" or theory. Therefore, it is necessary to decide on the choice of story that can be developed. The core category is very important for the data and this category links the data to each other; The core category explains the variations in the data (Strauss and Corbin 1998) and thus provides a theory that describes the social processes surrounding the phenomenon.

The data was collected through semi-structured interviews, aiming to utilize the perspectives and expertise of individuals highly skilled in the research subject to investigate and analyze the topic.

Assessment of research findings' quality as follows:

Proportion: Do the results align with the expertise of professionals and the experiences of participants? Can the participants see themselves in the story even if it does not involve them in every detail? Do the results accurately reflect their sense of reality? Do both participants and professionals show an emotional reaction to the findings?

The research findings were shared with 7 interviewees. They confirmed it after observing the findings. In addition, the findings were discussed and examined with the experts in the field, which resulted in more confidence in the findings.

Application: Do the findings offer new explanations or insights? Are they applicable for policy development, change practices, or expanding the knowledge base?

The findings of this research help agricultural research institute managers in identifying and ranking the economic and financial factors impacting research and

development within these institutes. Additionally, they support policymakers and managers in this domain by informing strategic decision-making.

Concepts: Concepts play a vital role in fostering shared understanding, discussions, and exchanges among professionals. As a result, it's expected that the findings will take shape as organizational concepts. The presentation of findings isn't the main focus. What truly matters is that these findings carry meaning, going beyond just a bulk of unexplained data, and inspiring understanding in the reader. Concepts need to develop in terms of their characteristics and dimensions to foster density and diversity.

Efforts were made to ensure that the research findings contained meaningful concepts, evolving within primary and secondary conceptual frameworks. Subsequently, the research transcripts were shared with seven interviewees. After reviewing the findings, they expressed their comprehension of the transcripts.Furthermore, the transcripts were discussed and examined by domain experts, ultimately confirming the validity of the findings.

Conceptual Contextualization: Findings without context are incomplete. Without context, the research reader cannot understand the events that have occurred or why specific meanings are attributed to an incident.

For this purpose, efforts were made to present research findings in a way that contributes to enhancing research and development in the agricultural industry.

Logic: Are there logical flows in ideas? Do findings hold meaning? Or are there missing links in logic that confuse the reader? Are cognitive decisions as clear as needed for the reader to judge their suitability in data collection and analysis?

To achieve this, there was an attempt to make the research findings tangible and ensure cognitive decisions were entirely clear, enabling readers to assess their suitability for data collection and analysis.

Depth: While concepts provide a common language for discussion and structure findings, depth entails descriptive details that expand diversity and take findings beyond conventional boundaries. Essentially, depth is the conceptual essence that distinguishes between insignificant findings and those with the potential to drive policy and action changes.

To achieve this, the concepts in this research were aimed at providing a common language for discussion and structuring data, allowing for deeper findings. The goal was to explore the innermost layers of influential economic and financial factors on research and development in agricultural institutions within the statistical population as much as possible.

Lability: Is there diversity in the data? Are there instances that deviate from an expected pattern or display variations in particular dimensions or characteristics?

In this study, efforts were made with the assistance of experts in applied research institutions to explore new dimensions of the phenomenon under investigation that might differ from the prevailing pattern observed in previous findings.

Creativity: Are the findings creative and innovative? Does this research offer new content or just provides old ideas in the new way?

In this study, efforts were made to present the findings in a creative and innovative manner. This was achieved through extensive data examination and repeated analyses.

Sensitivity: Did the researcher show sensitivity to both participants and data? Were the questions about data collection formed through analysis and investigation, or were the concepts and questions developed before data collection? Have the data collection methods been conducted with precision and sensitivity through research and analysis?

In this study, efforts were made to employ semi-structured interviews. Initially, a set of questions was introduced, but during the interview process and data collection, new questions arose that directed the research.
Note-taking and Documents: Given the limitations of human memory to retain every insight, questions, and level of intellectual depth during analysis, note-taking emerges as a fundamental phase in the research process. These notes should progressively evolve in depth and abstraction in line with the advancement of the study.
In this study, efforts were made to take notes during the interview process on the points that came to the researcher's mind. Also, during the analysis process, the key points from the notes were entered into the MAXQDA software. In the initial stage of data collection, a total of 17 interviews conducted with experts were reviewed. These experts included 15 men and 2 women, possessing Master's and specialized doctorate degrees, and having professional experience ranging from 9 to 30 years. In the second phase, the interview data analyzed using a three-stage coding process (open, axial, selective coding) in MAXQDA software, and the resulting outcomes will be further explained.

3. Findings

In the initial phase of data collection, an examination was conducted on 17 interviews carried out with experts. The experts consisted of 15 males and 2 females with work experience ranging from 9 to 30 years. Their educational qualifications varied from master's degrees to specialized doctorates. In the second phase, the interview data analyzed using a three-stage coding process (open, axial, selective coding) in MAXQDA 2018 software, and the resulting outcomes will be further explained.

- Open coding

In the process of open coding, significant data units receive an initial label with a conceptual name. Then, employing more abstract terms, these conceptualized data are grouped into what are termed 'categories'. In the next step, the characteristics and dimensions of the derived categories are further developed by examining the data. In practice, these stages are not linear and typically happen simultaneously with considerable overlap. In this stage, the researcher endeavors to identify underlying concepts within the collected interview data through review. In the table below, a description and analysis of a section of the open coding are presented. In the Grounded Theory strategy, for open coding, the smallest conceptual units in qualitatively collected data from interviews are extracted based on levels such as causal conditions, contextual, interventions, strategies, and consequences, employing an exploratory approach.
The results obtained from the open coding of qualitatively collected data using interview tools reveal the identification of 28 open codes among 378 conceptual elements.

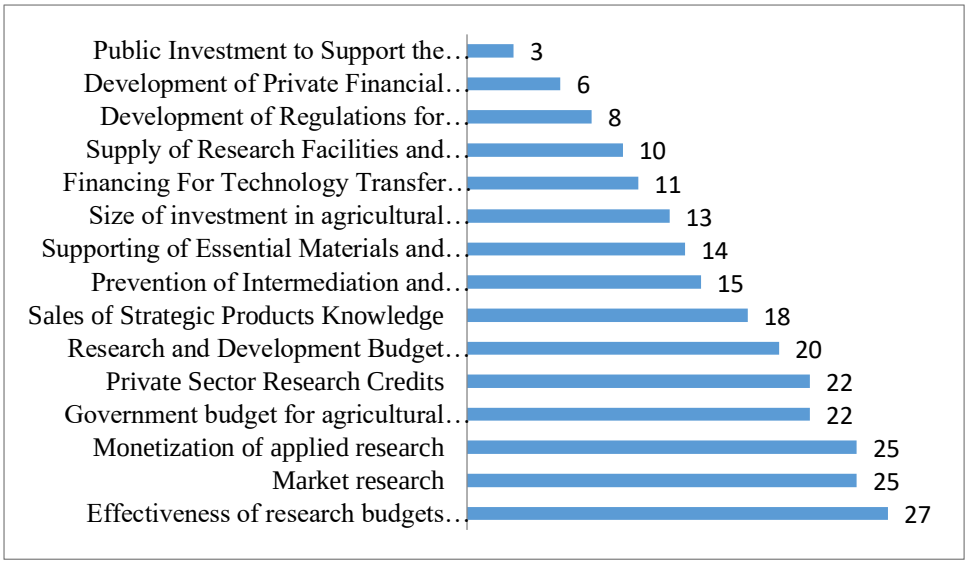

Figure2- The most significant open codes related to economic and financial impacts on the research and development of agricultural institutions based on the repetition frequency in MAXQDA 2018 software

- Axial Coding

In axial coding, distinct categories are systematically arranged within a meaningful framework, particularly emphasizing the relationship between the core category and other categories. In this study, the Strauss and Corbin paradigm was utilized for axial coding. This paradigm offers a cohesive framework that allows the assessment of potential relationships among concepts. This paradigm offers a comprehensive understanding of the phenomenon as it identifies causal and contextual conditions that prompt an actor to engage in a specific activity, defining the core category. It involves the adoption of strategies to manage emergent situations and attain the core category. Intervention conditions, either facilitating or impeding the impact of causal and contextual conditions on the core category, are established. Moreover, it demonstrates the resulting outcomes from the implemented strategies. The aim of this stage of coding is to establish relationships between the categories generated during the open coding phase. This process aligns with the paradigm model and assists theorists in easily formulating theories.

Axial coding results in the formation of groups and categories. All similar codes are grouped together within their specific category. In this regard, all the created codes are reviewed and compared with texts to ensure accuracy. The results of Axial Coding are presented in Table 3.

Table ۲ - Results of Axial Coding

Category Type	Category	Open Codes
Causal Condition	Research Funding	Managing Agricultural Research Budgets
		Research Payroll
		Sufficient Research Funding in Agricultural Research
		The Government Budget for Agricultural Research and Development
		Private Sector Research Credits
	Optimal Capital Allocation in Research	Sufficient Investment in the Agricultural Sector
		The necessity of investment in food and fiber
		Public Investment to Support the Agricultural Sector
		The Size of Investment in Agricultural Research and Development
Contextual Conditions	Legal Infrastructures	Management of Establishing Agricultural Innovation Centers' Structures
		Private Financial Development bylaws for Agricultural Research
		Development of bylaws for Agricultural Research Investment
		Development of Regulations for the Promotion of Researchers
Intervening Conditions	Technological Infrastructures	Activities of knowledge enterprises
		Strengthening the infrastructure of stations and research centers
		Provision of facilities and research equipment
		Financial provision for technology transfer and technology management
Strategies	Supporting producers	Financially supporting farmers
		Preventing intermediaries and imports of agricultural products
		Supporting the import of essential materials and equipment
Consequences	Research management	Financial management and support for research farms
		Research and Development Budget Management
		Effectiveness of research budgets distribution
	Commercialization of achievements	Monetization of applied research
		Patent
		Sale of strategic knowledge products
		Market research
		Marketing

- Selective Coding

In this stage of the Grounded Theory method, related items are categorized together to ultimately lead to the presentation of a model derived from empirical data. Selective coding is the process of integrating and refining theory (Strauss & Corbin, 1998). In the final stage of selective coding, the primary concept derived from earlier coding steps is systematically connected to other concepts, establishing meaningful relationships. This process validates connections and improves concepts needing further refinement and development. It's important to note that the above steps have been carried out in an iterative process. As a result, the selective coding steps are not isolated; instead, they are part of an interactive process that involves both open and axial coding. At this stage, several participating experts were invited again to provide their insights regarding the process of developing the model and its final version. The experts confirmed the derived model, although some of them had recommendations for improvements. These suggestions for improvements went through an iterative revision process. Ultimately, the experts confirmed the model. To achieve integration and present the final model, the process involved identifying the core category and establishing connections among other elements within a systematic paradigm of grounded theory. This structured approach refined the initial design pattern, developed key factors, and

culminated in the creation of the ultimate research model.

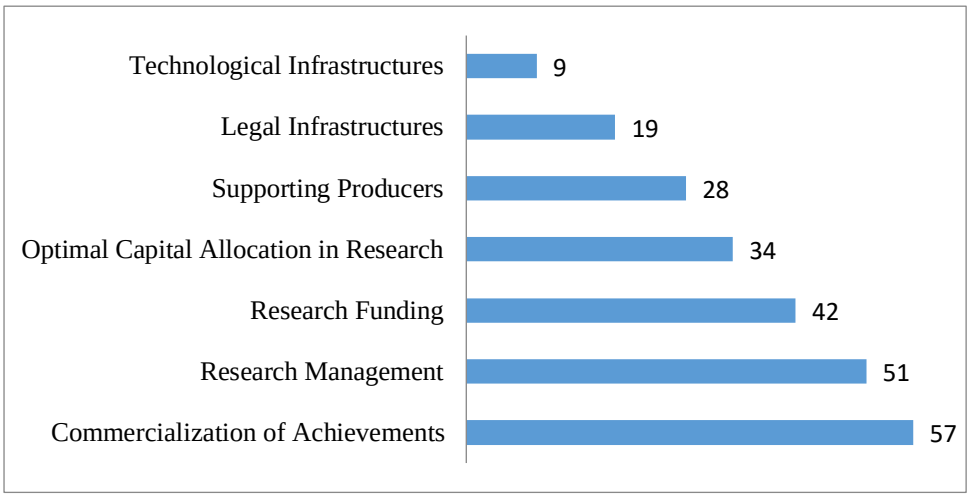

Fig3- Key economic and financial categories influencing research and development in agricultural institutions based on frequency of occurrence in the MAXQDA 2018 software

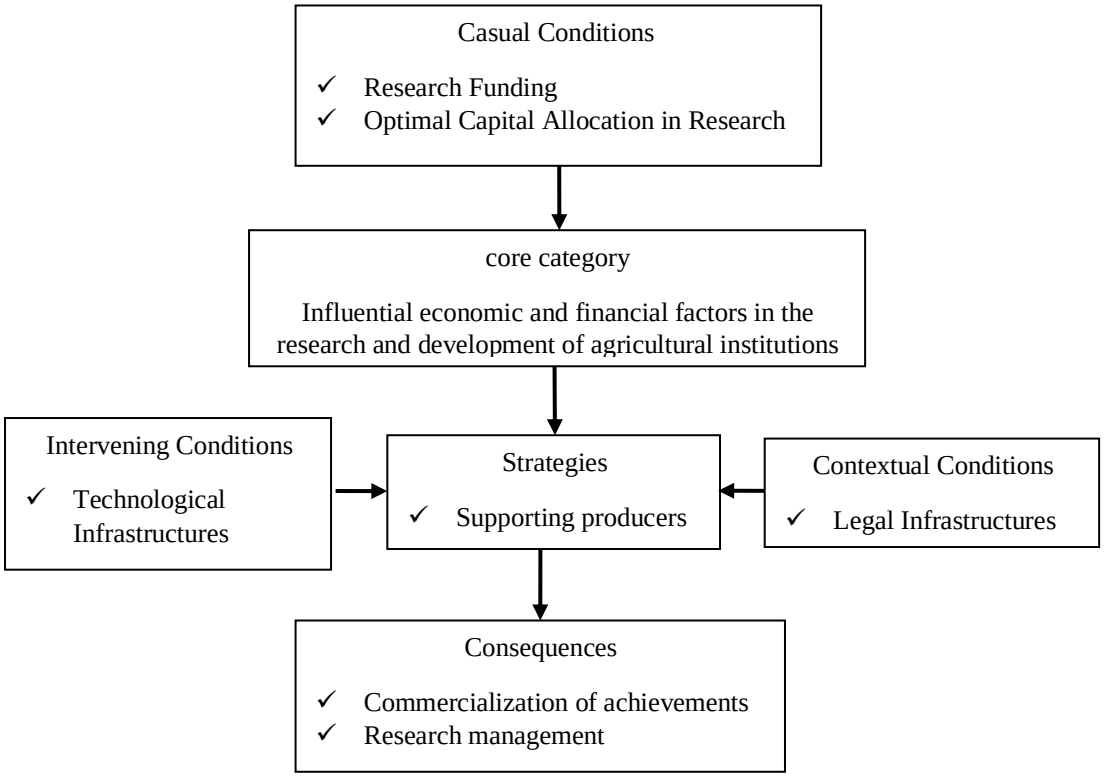

Fig4-Qualitative Strategic Paradigmatic Model

4. Results and discussion

The results showed that the categories of financing research, proper investment in research, legal infrastructure, technological infrastructure, support and support of the producer research management, commercialization of achievements are the most important economic and financial categories affecting the research and development of agricultural institutions.

In the process of selective coding, narrative storytelling is used to discover the research's core category and integrate it with other concepts within a paradigmatic model. This model explanation describes causal conditions as elements directly impacting or fostering the central phenomenon, often identifiable through systematic data analysis and event review. The findings indicate that 'Research Funding' and 'Optimal Capital Allocation in Research' can be influential causal conditions in agricultural research and development. These results are consistent with the research of Laleh et al. (2018), Meridsadat et al. (2017), Shahabadi et al. (2014), Espada et al. (2019), Yazgan et al. (2009). The core category, representing the primary focus of this study, encompasses the influential economic and financial elements affecting research and development within agricultural institutions. It serves as the fundamental basis connecting all other significant concepts. Leveraging the study's findings makes it feasible to explore the influential factors impacting this phenomenon, the strategies derived from it, and the resulting consequences and outcomes. The strategies represent the actions proposed in response to the core category, carefully chosen to effectively implement the core category. The interviewees in this study referred to 'Supporting producers' as a strategy. Generally, contextual conditions are specific factors beyond organizational control; however, our strategies are impacted by them. Regarding these elements, the interviews have primarily highlighted Legal Infrastructures. Thise result is in line with the researches of Pour Ali Moghadam et al. (2018), Moridalsadat et al. (2017), Laleh (2015), Sharifzadeh et al. (2010). Intervening Conditions, which modify casual conditions and impact strategies, were mostly referred to as Technological Infrastructures in the conducted interviews. This indicates how these factors facilitate the execution of adopted strategies. The consequences and outcomes derive from implementing successful strategies, which in turn contribute to achieving the core category. As a result, the interviewees in this study have highlighted the 'Commercialization of achievements' and 'Research Management'. These results are in line with the research of Haji Mir Rahimi et al. (2018) and Mohammad Hashemi (2018).

The constraints of this study involve concentrating on applied research within the domain of agriculture at the Agricultural Research, Education, and Extension Organization in Tehran. Furthermore, there's limited acquaintance of the statistical population with the scientific literature on research management, particularly in applied research. In conclusion, due to the close relationship between technology and innovation with applied research, it is proposed to present a model of the relationship between technological and innovative capabilities with applied research capabilities for future research.

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