IDENTIFYING THE FUNDAMENTAL ELEMENTS OF KNOWLEDGE MANAGEMENT FOR FOSTERING SUSTAINABLE AGRICULTURE

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ABSTRACT

The purpose of this action was to recognize the elements of knowledge management that can aid in enhancing agriculture's capacity to address food shortages and provide essential products for food security. Also, identifying these components will help the agricultural sector to compete in the market and adapt to the pressures of global and local demand for food. and for the importance of agriculture in sustainable social, economic, and environmental development, and the existence of a gap in this field, this research aims to formulate and evaluate the role of knowledge management in achieving sustainable agriculture development through content analysis. To this end, a qualitative content analysis method with a deductive approach was employed. The research sample comprised 29 articles, 15 university theses, and two books. All of them were completely related to the subject of the study.the results revealed that knowledge management processes include: acquiring knowledge, storing knowledge, transferring knowledge, and applying knowledge; and in the field of sustainable agriculture, there are three main dimensions including social, economic, and environmental dimensions. The results of this research can provide direct feedback on the successes and failures of policy tools and initiatives in supporting the role of knowledge management in the countries' agricultural sector, which can help reduce food insecurity and increase economic growth, through strengthening policies and providing visibility.

Keywords: Acquiring knowledge; Storing knowledge; Transferring knowledge; Applying knowledge.

INTRODUCTION: -

Scientific and technological progress is a crucial issue for all developed and developing societies, and therefore the development of any society depends largely on the success of this society in mobilizing and organizing its efforts to take advantage of the available scientific and technological capabilities (Russ, 2021). Given the interest of all societies, especially developed ones, in adopting new science and technology methods, the world is now going through a phase of rapid scientific and technological transformations that are expected to achieve tremendous progress in all areas of life(adler,2017),as a result of the rapid changes witnessed in recent decades, such as globalization and the development of communications technology. Information, the use, and application of the term knowledge management have become one of the necessary pillars for qualifying various developing and developed countries to achieve economic competitiveness and information security (Boznak, 2013).

In light of the spread of advanced technology, especially with the increased need for investments with the slowdown in the growth of the global economy (Garcia-Herrero et al., 2020; Adler et al., 2017); The dimensions of knowledge management have become real programs adopted by countries of the world, which require cognitive development for institutions to keep pace with these changes, so institutions must be supported with the latest technologies. This represents cognitive growth, which determines how to replace one technology with another technology and the appropriate time

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for that, i.e., replacing one competitive advantage with another, where the use of available capabilities is maximized and supported by information. This is while the technological revolution has destroyed the political, geographical, and cultural borders of the countries and the territories are forced to adjust themselves to these growing changes (Jaber, 2018; Kellner & Kellner, 2021).

Modern agriculture requires innovative technology that constantly aligns scientific knowledge with agricultural requirements. Agricultural technology is not limited to simply using agricultural mechanization but extends to more than that. This includes providing new inputs for agriculture, including seeds and fertilizers; Which means that sustainable agricultural development deals with different sectors (Ceylan, 2007; Sims, & Kienzle, 2017). This includes not only the agricultural sector but also water, energy, food, etc. (Choobchian et al., 2022). Knowledge is considered an integral part of agricultural systems and is embodied in the experiences and trends of farmers, and this is evidence of the existence of knowledge in the agricultural sector worldwide.

Sustainable agriculture relies on intensive knowledge and to realize this, key functions such as extension and marketing, including research and education, must be fully integrated (Brudt et al., 2011; Klerkx & Jansen, 2010), while in knowledge management in agriculture, there are persistent knowledge gaps. An agricultural knowledge system emerges when supply and demand are studied in this process, because the agricultural sector needs knowledge without knowing how to request it, as opposed to an agricultural research sector that has this knowledge and does not know how to spread it. Therefore, creating and activating the agricultural system requires not only the presence of knowledge but also the basics and tools of knowledge management (Zahran, 2012; Kashirskaya et al., 2020).

Among the most important principles of agricultural sustainability are scientific, technological, and technical innovations, which depend on improving the management of land, water, and air resources, improving waste management, raising productivity, and reducing the consumption of non-renewable energy sources. Modern planning to secure countries' resources, especially in the agricultural sector; requires many innovations in all fields, especially resource management; in addition to guaranteeing sustainability in the use of these resources as one of the dimensions of the smart economy, which includes the main areas of energy, waste management, etc.; It is necessary to create the required conditions to improve the quality of life and food security for the members of society (Hussein and Ali, 2017).

During the last three decades of the 20th century and the first decade of the 21st century, the concept of environment has changed drastically; Previously, the concept of environment was only related to the pollution of ecosystems. While the concept of development has been expanded to include the green economy. Several developed countries formed policies to activate this concept in different sectors and integrate it into sustainable societies, environmentally friendly cities, sustainable agriculture, and investments in rationalizing the use of water and energy (Ogrezek et al., 2020; Hickel & Kallis, 2020).

Therefore, the current study is based on the following:

First: Taking into account that agricultural activity is an important and influential investment element in achieving economic return or profitability.

Second: Paying attention to individuals working in the field of agriculture, developing their capabilities and improving their efficiency through training and education, and their contribution to creating and innovating new social systems through agricultural projects.

Third: Intensifying efforts to preserve the environment and its diversity and not harming its components, and highlighting the concept of the

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environmental dimension as a general, influential, and crucial concept.

If these elements are integrated with the correct principles of knowledge management through correct and balanced exploitation, protection, and development of all available resources in a way that provides food security and achieves safe and clean food and agricultural products continuously, long-term and sustainable efforts. They can be sufficient and efficient for the members of the agricultural community involved in these agricultural projects as well as the non-agricultural community. This will not be achieved without the accurate identification of the key components of knowledge management that play a significant role in the development of sustainable agriculture.

Statement of the research problem:

Agriculture is considered one of the main economic activities that contribute to the national economy. Food security is linked to national security, and achieving food security depends mainly on providing food from local agricultural production. Directly and indirectly (Abdel-Daem, 2017).

In other words, developing the agricultural sector contributes to combating unemployment, reducing the volume of imports, developing and advancing society, and strengthening the national economy, in addition to making the local product safer and more secure for society. It is noted that there is a weakness in agricultural production that may be caused by a weakness in the correct use of knowledge management elements. The researchers studied this research.

Research aims:

What are the essential elements of knowledge management to promote sustainable agriculture?

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To achieve this goal, it was necessary to review the background of research studies conducted on the topic under investigation and extract indicators to measure them. Below, and in line with the purpose of the research, the results of some relevant research have been briefly presented (Table 1).

Table (1) Research related to knowledge management and sustainable agriculture

Title	Researchers	Findings	Determinants
Role of knowledge management on the sustainable environment: Assessing the moderating effect of innovative culture	Weina & Yanling, 2022	The study revealed that the presence of environmental awareness played a crucial role in mediating the connection between KM practices and a sustainable environment.	Environmental Awareness, Knowledge Management Practices, Innovative Culture
Knowledge management and organizational creativity in the Algerian institution	Bousahla Slim, 2022	Failure to rely on the infrastructure for knowledge management avoiding all obstacles that encourage it, and weak motivation for workers to complete their work	Knowledge management indicators have a clear impact on administrative creativity in institutions
The influential relationship of knowledge management on achieving sustainable human	Shaima, 2022	Weakness in enhancing the status of knowledge by adopting an innovation strategy that requires improving skills in management, in addition to the weakness in	There is a significant mediating role of organizational complexity in the influential relationship between knowledge

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development in		enhancing information culture and continuing to invest in research and development, paying attention to skills and working to refine them through continuous training and education.	management and sustainable human development.
Analysis of the reality of sustainable agricultural development for agricultural production of the potato crop, and its obstacles in Baqubah District (a local study).	Uday Hisham, 2022	Neglect of agricultural lands, failure to adopt a marketing policy, and lack of modern irrigation methods	Dimensions of agricultural development (environmental, technical ,social, economic)
Geographical obstacles to sustainable agricultural development in the countryside of Ramadi District	Muhammad, 2021	Continuing the price policy by purchasing crops from farmers the government, except quickly perishable crops, to achieve large returns for producers. Also, working with old irrigation methods, compared to other irrigation methods, will contribute greatly to the accumulation of amounts of salts in the soil, leaving lands unsuitable for agriculture.	Making the best use of the land according to the available resources.
The role of knowledge systems in achieving sustainable agricultural development in the Republic of Yemen (a case study of Dhamar Governorate.	Al Habal, 2021	Weak physical and financial capabilities.	Paying attention to the relationship and linking mechanisms that could occur between all agricultural systems in the future, determining the level of participation of respondents in extension activities.
Threats to the sustainability of agricultural development in the Republic of Chad	Amin, 2021	The presence of a traditional farming pattern, overgrazing	Proper planning aims to develop natural resources and increase agricultural production.
The role of geographical factors affecting agricultural development in Chad	Amin, 2021	The fluctuation of cultivated areas and with it the fluctuation of production, and the major role of geographical and economic	Provides sources, references, and research.

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		factors in the variation in production	
Knowledge management as an entry point to achieving sustainable development of human resources in learning organizations	Kamal & Muzayrq, 2020	Difficulty in measuring due to the lack of transition from storing knowledge traditionally and not paying attention to the cultural awareness of the various dimensions of sustainable development of human resources.	Having knowledge management indicators and trying to share them to achieve sustainable development
Knowledge management and sustainable development	Wu, et al., 2019	Knowledge management is essential for sustainable development	Knowledge management consists of "creating, utilizing, sharing, storing, and managing knowledge and information".
Case study of Cairo city -Requirements for applying knowledge management in Arab cities	Samir, 2019	The organizational structures are hierarchical, and the leadership style and organizational culture are characterized by centralization and the lack of availability of information to everyone, which is inconsistent with knowledge management. Information technology is also hampered by many problems	Considering organizational culture, information technology, and knowledge application as key indicators
Knowledge management and its role in activating creativity in service institutions (Algeria Telecom Corporation - El Oued(	Hatem et al., 2019	To enhance the process of creative thinking, knowledge generation is essential.	Knowledge management, through its processes (generating, storing, disseminating, and applying) knowledge contributes to achieving the organization's goal.
The Role of Knowledge Management Practices in Promoting Sustainable Development, an applied study on a Group of Municipal Directorates in Anbar Governorate in Iraq (a local study).	Hatem, 2019	Lack of openness with the outside world and the surrounding development in terms of sustainable development due to the lack of clarity in the dimensions of knowledge management	The presence of knowledge management indicators in government departments and considering them as a basis for building functional capabilities.
Challenges of agricultural	Al-Jadba, 2018	The weakness of natural and human resources and their failure	Availability of natural and human conditions, increased

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development		to develop and exploit them optimally.	investment, and job creation
Knowledge management and its relationship to administrative creativity among school leaders in Mecca from teachers' point of view.	Muhammad, 2018	Not using the Internet in the process of exchanging knowledge, and the necessity of introducing administrative creativity and knowledge management in evaluating the job performance of school leaders.	There is a relationship between the degree of knowledge management practice and the level of administrative creativity among school leaders.
Sustainable agricultural development in Iraq - reality and challenges (local study)	Mahe, 2017	Water resources, agricultural pests, land salinity problems ,and agricultural technological problems.	The importance of the dimensions of agricultural development (economic dimension / social dimension / environmental dimension / technical dimension).
Knowledge management and sustainable agriculture: The Italian case	Zecca & Rastorgueva, 2017	Any form of KM organization is important for sustainable development, and farmers are incentives to apply any practices of KM to improve the performance and competitiveness of their enterprises	KM in organizations and KM in farms.
Knowledge management and its role in building a knowledge society and achieving sustainable human development (a local study).	Nagham Hussein Neama, 2011	Weak encouragement of the exchange and flow of knowledge and information and working to invest it to activate skills and experiences and work to stimulate them to generate and produce knowledge	The importance of knowledge management has increased unprecedentedly in recent years and has gained increasing recognition as a practical procedure and implementation mechanism because it plays a crucial role in achieving sustainable competitive advantage.
Knowledge management and its role in organizational creativity In Jordanian companies	Ali Falah Al-Zoubi, 2010	Knowledge according to its strategies is the basic rule for competition	Knowledge matching to its strategies is the basic rule for success.
The level of knowledge of farmers about some sustainable agricultural practices, a field study in Al-Shamiya District / Al-Diwaniyah Governorate in Iraq (a local study	Bassem Halim Kashash, 2009	Not conducting more applied extension studies and using multiple and varied extension methods	The presence of indicators for knowledge management and its dimensions in organizing and developing agricultural work

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According to the background of the research, to the best of our knowledge, no research has been done specifically identifying the effect of knowledge management components on agricultural development, and this research is an attempt to fill this knowledge gap. It can be said that in most of the studies that the researcher touched on, indicators are facing the insufficient use of knowledge dimensions in developing sectors and institutions, including agricultural institutions.

On the other hand, the indicators that were studied to measure knowledge management in governmental and non-governmental institutions, including agricultural institutions, are not comprehensive. In addition, no study has been conducted to determine indicators of sustainable agriculture due to monitoring knowledge management.

As a result, there is a need for a coherent approach and framework to comprehensively evaluate KM indicators and dimensions in this sector. Therefore, this study seeks to identify indicators of knowledge management in the field of agriculture using the appropriate method. In this regard, the current study seeks to answer the following.

-What are the indicators and dimensions of knowledge management and its role in achieving agricultural development?

Materials and methods: -

The research methodology was to review library documents and previous literature and extract indicators of knowledge management in agriculture. The statistical population includes all relevant articles in this field in reputable national and international journals published in the period 2007-2022.

Some keywords were searched to find articles including (knowledge management, agricultural development, agricultural development indicators, and dimensions of knowledge management)

To select international articles, 57 journals were selected and their research was reviewed, most of which were related to (knowledge management, agricultural systems, agricultural development, agricultural education, and agricultural extension). In national journals, 22 journals were studied, most of which were in agricultural, agricultural economics, development, and science journals.

The selection process was to initially identify 88 articles, 15 theses, and 2 books, by relevant titles, which were reviewed according to abstracts and relevant keywords. In addition, after reviewing the articles 29 scientific papers were selected, and 33 articles were without a valid publisher which was excluded from the review. Likewise, 26 were excluded that did not have a strong connection to the topic. So, the research sample consisted of 29 articles, 15 university thesis, and two books.

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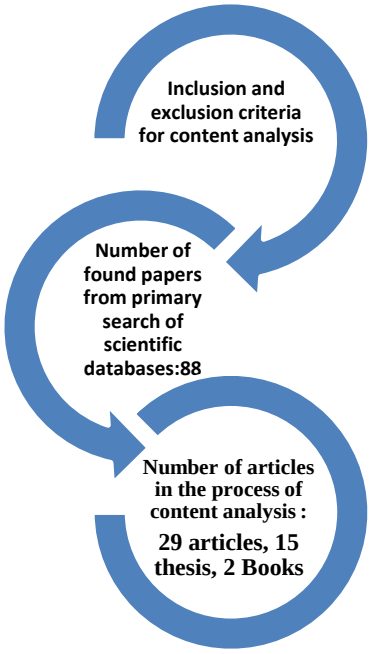

Figure 1. Steps to selecting articles and inclusion and exclusion criteria for articles in the process of content analysis (esearcher design).

Qualitative content analysis based on the deductive approach was employed, which some have called "directed content analysis". The research started with a theoretical framework related to knowledge management components (Acquiring knowledge, storing knowledge, transferring knowledge, and applying knowledge (Turner, et al., 2012; Gao, et al., 2018)); and the (social, economic, and environmental) dimensions related to sustainable agriculture, and these components were used to name the main categories.

Figure 2. Stages of categorization and coding of data in qualitative content analysis with a deductive approach(Researcher design)

The results of Table (2) show that among the main categories in the field of knowledge management, acquiring knowledge and applying knowledge occupy the highest frequencies. Due to its importance in improving the level of job performance of workers in agricultural institutions through training, study, and exposure to modern science and experiences, as well as the importance of applying these sciences and experiences. Moreover, make it accessible to others, with the need to train on it and apply it well to ensure benefit from it. This result is consistent with the results of the research reached by researchers (Hamza, 2013 - Salman, 2010 - Sharif, 2009 - Al-Ghalbi, 2011).

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In addition to the indicators related to sustainable agriculture, the economic dimension occupied the greatest importance among other dimensions due to the importance of economic resources in human life and their necessity in developing and improving life. This result is consistent with the results of (Ismail, 2020 - Bahaa, 2019 - Imad, 2018 - Omar, 2018 - Othman, 2014 - Jamal, 2012).

Table (2) Main categories related to knowledge management and sustainable agriculture

Main categories	**Concepts**	**Researchers**	**Frequencies**
The acquisition of knowledge	1-obtaining Knowledge from various sources (experts, specialists, competitors, customers, databases, or through the organization's archive); 3- Using means of benchmarking, attending conferences and workshops; 4- Using experts, periodicals, publications, e-mail, and self-learning. 5- Focus is given to the quality and accuracy of the information.	Gardeazabal et al., 2023; Espérance et al., 2020; Mahr & Lievens, 2012; Smith, 2001; Abdel, 2019; Khalifa, 2020; Mayouf, 2020; Muhammad, 2018; Batran, 2022; Bousahla, 2022 Hatem, 2019; Muhammad, 2018; Ahmadyoosefi, et al., 2021	10
Knowledge storage	1-involves capturing, transcribing, and coding knowledge. 2- to take documents with knowledge embedded in them and store them so that they can be easily retrieved in the future. 3- Collecting and storing information accurately and in a way that is easily achieved for everyone to use.	Gardeazabal et al., 2023; Pouchard & Bracke, 2016; Muhammad Abdullah, 2018; Shaima Al-Batran, 2022; Mayouf & Ashour, 2020; Samir,2019; Hatem Khalil, 2019; Bousahla, 2022; Ahmadyoosefi, et al., 2021	8
knowledge transfer	1-Act through which, acquired information, knowledge, ideas, skills, and experiences are transferred and shared among people, organizations, and institutions; 2-Discourage Knowledge hoarding; 3-Encouraging others to transfer their experiences and knowledge; 4-Participating in knowledge and experience exchange meetings; 5-Having enough time to share their knowledge and experiences; 6-Supporting relevant institutions to spread the experiences and knowledge of people. 7- Encourage collaborative knowledge	Gardeazabal et al., 2023; Ahmadyoosefi, et al., 2021; Ali Falah Al-Zoubi, 2010; Nagham, 2011; Al Habal 2021; Scar, 2012; Cawley et al., 2023. Romańczyk, Z., Janc, K., & Czapiewski et al., 2012; Ahmadyoosefi, et al., 2022.	7

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	sharing		
Application of knowledge	1-Using the experiences of beneficiaries in the implementation process; 2-Using new knowledge and information about the development programs to solve implementation problems; 3-Using posters or booklets related to the development plan; 4-Evaluation of knowledge sources related to the concept; 5- Checking the organizational structure; 6- Encouraging a culture of teamwork.	Gardeazabal et al., 2023; AhmadYousefi et al., 2022; Slijper, et al., 2023; Bousahla Slim, 2022; Bassem Halim Kashash, 2009; Al-Batran, 2022; Al-Dhubyani, 2018; Hatem Khalil, 2019; Kamal et al., 2020.	6
Economic aspect	1- Productivity and profitability	Seok & Moon, 2021; Lie et al, 2023; Nouran Abdel Jawad, 2022; Bok Jin, 2010; Louis Armin, 2010; Shammari, 2006; Hashem, 2017; Rmeid 2017; Amin, 2021; Okolo-obasi & Uduji, 2023; Mileva et al., 2018.	17
Social aspect	1- Decentralization and participation: 2- Knowledge, culture, and empowerment: 3- Quality of life: 4- Research and development: 5- Institutional development: Determination of environmental	Xie & Zhang, 2023; Ferreira et al., 2023; Cugueró-Escofet et al., 2019; Louis Armin, 2010; Shammari, 2006; Nabila, 2017; Rmeid 2017; Baraka, 2021; Quisumbing et al., 2014; Tamsah et al., 2020.; Houessou et al., 2023.	14
Environmental aspects	1- Protection and restoration of natural resources: 2- Management, supervision and	Miller et al., 2023; Biscotti et al., 2018; Nouran Abdel Jawad, 2022; Bok Jin, 2010; Louis Armin, 2010; Shammari, 2006; Nabila, 2017.	11

According to the studies and content analysis, the mind map of the research is presented in the form of Figure 3.

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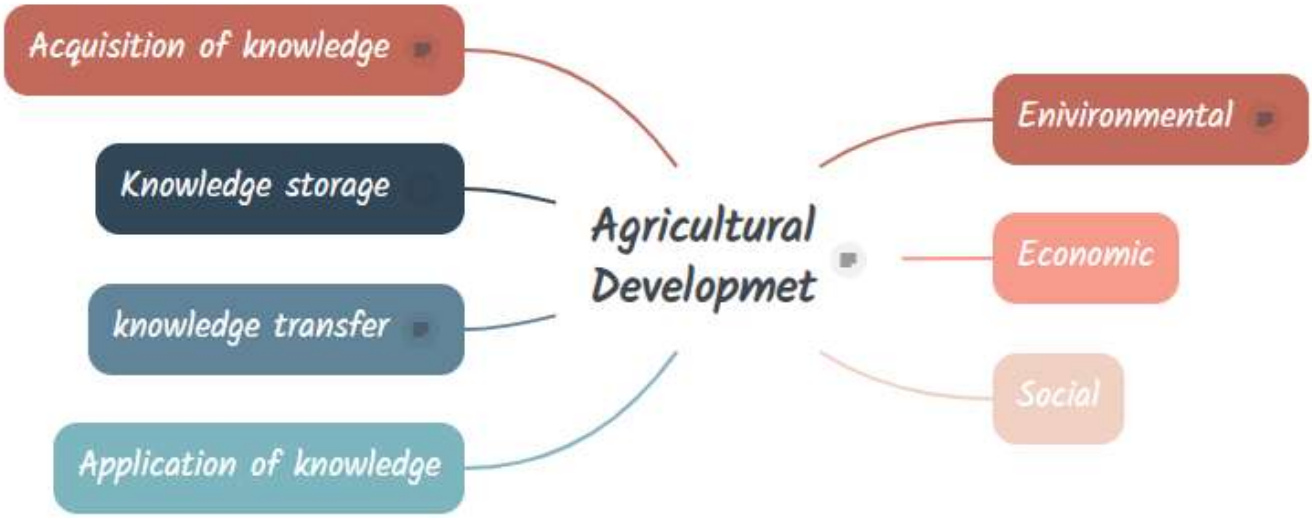

Figure 3: Mind map of KM components' impact on sustainable agriculture development

DISCUSSION AND CONCLUSION: -

The previous results, this research emphasizes that institutions of all sizes and types of activities, if they want to continue to exist and ensure their position in a ruthless competitive economy, must pay great attention to knowledge management, as there is an important relationship between sustainable agriculture and knowledge management. Development goes through the good combination of knowledge present in an organization, and therefore it is the correct interweaving between tacit and explicit knowledge and is based on the skills available and developed in the organization through working on the foundations of knowledge management.

Modern search engines contribute to providing various solutions to the problems raised, whether they are organizational problems or administrative problems related to work. This is linked to the theory of knowledge management, which relies on electronic knowledge to facilitate work methods, and then achieve organizational goals, in addition to providing a set of strategic solutions that ensure the provision of a range of high-quality services.

Obtaining and controlling knowledge also helps to provide unconventional solutions to the problems raised, which has led to several results, including that knowledge management and control works to develop strategic and unconventional solutions to the problems raised within the organization, as this knowledge works to create an atmosphere of interaction between employees and knowledge acquisition. In addition, shaping the cognitive structure; leads to the creation of a new way to find solutions for problems that guide people to increase and develop knowledge, which has a positive reflection. After drawing the general results of the current research; The findings were compared and discussed with the results of previous studies.

Some studies have concluded that the expected market for knowledge management products and services will grow significantly in institutions, which is consistent with what our current study concluded, as it will continue to grow due to modern technology adopted in institutions of all types and nature of their activity, in addition to the idea of

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initiatives; individuality provided by employees.

Also, other studies were concerned with issues of collaborative knowledge sharing. They dealt with collaborative knowledge and concluded that collaborative knowledge as an indicator for achieving knowledge management would attain organizational development at work, which is consistent with the current study; which emphasizes that delegating knowledge among colleagues would contribute to achieving organizational goals. Building a rational knowledge society contributes to managing and controlling problems and reducing their occurrence.

Some studies related to the role of knowledge management in achieving administrative creativity, which are consistent with the current study, also indicate that participatory knowledge contributes to pushing employees to innovate new methods that lead them to innovative solutions to the ongoing problems they face.

On the other hand, it was found another study on the impact of the knowledge creation process on organizational creativity in the General Organization for Social Security, concluded that allowing workers to express their ideas would contribute to achieving knowledge and sharing it among them.

Other studies have concluded that the development of modern technology and communications, which makes the worker's vision clear due to the establishment of formative and training courses to transfer knowledge and skills; is a motivator to achieve the goals of the organization.

Finally, it was concluded that it is an important theoretical legacy that has greatly helped the literature in delineating the characteristics of knowledge management for sustainable agriculture development and highlighting the knowledge gaps that previous studies had ignored.

Therefore, in light of the findings, recommendations are as follows:

- Proposing a model for applying knowledge management consistent with the organization's specifications;
- The necessity of creating infrastructures for knowledge management and avoiding all the obstacles that prevent it.
- Motivating workers to complete their work in new, creative ways to ensure that workers do not feel bored.
- The organization's interest in attracting workers with more qualifications and experience to create new ideas.
- Participation of all employees in the organization's official meetings and encouraging teamwork

Political implications:

The measurement insights presented in this study can help policymakers in agricultural sectors to set innovative targets for the sector and effectively develop existing policy instruments so that they can improve performance in agriculture through the effective use of knowledge management, and also help them better understand the current situation. Future development trends obtain feedback on the positive and negative impacts of current policies and formulate appropriate policies.

They will therefore need information from knowledge management measurements as well as evidence that can help answer questions about key policies related to the agricultural situation.

Understanding the characteristics, patterns, and dimensions of knowledge management provides a basis for policymakers to design and use specific policy interventions effectively and promptly.

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Finally, this research can provide direct comments on the successes and failures of policy tools and initiatives to enhance the role of knowledge management in the developing country's agricultural sector by enhancing policies and visions for manufacturers about the importance of knowledge management in this sector, which can help achieve self-sufficiency, food security, and economic growth.

Limitations and further research:

This study provides an overview of knowledge management measurement indicators retrieved from a review of published theoretical literature related to this topic.

The results of this study can be used to better guide future research on measuring the role of knowledge management in agricultural development. As a result, future research can use the indicators extracted in this study for measurement in the case of studying knowledge in the agricultural sector. It allows policymakers and businesses to improve their decision-making processes accordingly.

The present study, like any other research, is not without its limitations. One such limitation is its exclusive reliance on the deductive content analysis method. However, this limitation can be addressed by integrating quantitative methods into the research approach.

By undertaking this task, researchers can lay the groundwork for future studies on measurement frameworks for effective knowledge management indicators, which are essential for the advancement of sustainable agricultural development. This initial step will provide a strong starting point for subsequent research endeavors.

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