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# Knowledge Management Model As A Strategic Tool For Agricultural Associations In Colombia

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**ABSTRACT.** In Colombia for the year 2017 the production of vegetables was 52784.75 (ton) occupying 4157.02 (ha), with a yield of 12.7 (ton / ha), which is established as a line of significant importance, In Boyacá, for the year 2018 the production of vegetables was 796.03 (ton ) occupying 172.00 (ha), with a yield of 4.63 (ton / ha), and a % share in domestic production of 4.14%. (Agronet, 2019), however, problems persist such as shortcomings in the generation of new thematic knowledge related to marketing and innovation, business management and technological development, therefore they have to go to intermediaries to position the product to the final consumer, in addition to this the lack of knowledge on the part of consumers and regarding the associations of producers AGROLIMPIO, AGRICOL GLOBAL and ASOCIACION SOGAMOSEÑA DE PRODUCTORES CAMPESINA, the weakness in the organizational structure; this is how this project aims to generate a model of Knowledge Management in marketing, business and technological management to the horticultural producers of the three Associations in the department of Boyacá, this research will be developed with a mixed approach methodology; where a qualitative method will be implemented qualitative approach with a research design of non-experimental descriptive exploratory type of transversal cut in focus group, where a Participatory Rural Innovation Model (IRP) will be implemented, the information collection strategies will be deployed through the focus group, interviews and survey, as expected results will be generated a knowledge management model focused on three topics such as the strategies of marketing, innovation in products and packaging, business management and the development of an information system that contributes to reducing the technological gaps that arise in these production systems.

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**Keywords:** Partnership, knowledge management, strategy.

## INTRODUCTION

In horticultural marketing at a global level, there are some trends in consumption, production and national policy, materialized in the preference for organic and fresh horticultural products, the importance of free trade agreements, the emergence of new

markets such as China and India, the formation of value chains and the proliferation of greenhouse crops.

In Colombia, the cultivated area grew from 2016 to 2017 by 2.7%, represented by 25 hectares, explaining this increase in institutional policies and programs of the ministries of agriculture and trade, industry and tourism. Similarly, production rose in this same year by1.1%, which meant "26% of the total agricultural sector in 2017" and 22.75% of the nationalagricultural GDP

Likewise, the horticultural sector created 676 thousand direct jobs, in 2017, with a 25% share of agricultural employment. Per capita consumption for this year was 248 grams/day, even lower than FAO's privileged 400 grams/day, which represents a good condition for improving production and marketing (Asohofrucol, 2018).

The department of Boyacá presents good conditions for horticulture in relation to soils, climate, availability of labor and cultural practices of crops; such is the case of the bulb onion, tomato and carrot, however, in its aggregate a slight decrease in the area planted in2016 is identified (Secretary of Agricultural Development of Boyacá, 2017).

Regarding the level of innovation, 66.67% of the associations do not make R+D investments due to lack of funding, 54.55% due to the absence of time for research and 31.82% due to ignorance of the execution of new developments. As for Information Systems(ICT), 11.76% of associations have web pages and 57.89% use the internet as a tool to improve business management. (Government of Boyaca, 2017, p. 133)

In addition to this, it is evident that knowledge management activities in the agricultural sector present difficulties, due to the low participation of academic and governmental entities in the development of this process.

### Horticultural production in Colombia

Horticulture is an activity with high levels of risk that is characterized by the following aspects: small crops (1/2 – 10 hectares), dispersed, intensive use of labor, high production costs, unstable and variable market, lack of appropriate technology, poor post-harvest management and business and union weakness.

According to (Corporación Colombia Internacional, 2006) The main characteristic of horticultural producers, except for some species, is that they develop in spaces of 1 to 2 hectares, and in many cases smaller. Crops that demand greater extensions for profitabilityare located in the range 2.1 to 5 hectares.

The first actor in the chain corresponds to the grower, responsible for advancing the production processes in different stages or main activities. Depending on the type of crop and the area, it has some different characteristics with respect to the practices or techniques used. Most are traditional growers, with several years of experience in cultivation, in the case of those who supply fruit and vegetable products for food consumption to Bogotá, 95% belong to this category, while 5%

corresponds to technified producers. The horticultural grower is subject to the bid price, determined by the intermediary, partly because he has to sell on the day of maturity of the product, because he has no storage possibilities. In some products such as leafy vegetables, tomatoes, aromatic plants for culinary use and others, the grower can act as an intermediary, managing relations with wholesalers, but in almost all cases, when their products are directed to wholesale centers, he sells at the door of the farm and at a lesser level to marketplaces.

On the other hand, in countries like Costa Rica, these producers are categorized into 3 groups: the first, with more than 10 years of experience in the sector, is dedicated exclusively to this activity, uses family labor, cultivates about one hectare, diversifiesproduction, is unionized and certified and has the lowest schooling, compared to the other groups. The producer of the second group is characterized by having about 7 years in the activity and almost exclusive dedication, makes little use of family labor, cultivates less thanhalf a hectare, is not necessarily unionized and / or certified and has an intermediate level of schooling. The third group corresponds to producers with fewer years of experience in this activity and the lowest dedication to it; make less use of family labour; have the smallestcultivation area and diversify production little; may or may not be members and/or certified; They have the highest schooling. (Camacho, Arauz, Barboza, Martinez, & Arias, 2015)

Colombia is the third Latin American country in horticultural production, with more than 966 thousand hectares cultivated among fruits and vegetables, with an estimated production of 10.7 tons that are part of the national offer available to consumers. (Asohofrucol, 2018). The main producing departments at the national level are Boyacá, Cundinamarca and Antioquia, handling a little more than a third of the national fruit and vegetable production, due to its productive culture and its high cultivated extension. Thus, in "Cundinamarca, the presence of potatoes stands out with more than 60% of the total, followed by mango and carrot; in Boyacá, the large participation of potatoes is evident with57%, followed by tomatoes and onions (both branch and bulb). Finally, in Antioquia the banana participates with around 35%, then potato, table tomato and tree tomato" (Asohofrucol, 2018).

As for the Department of Boyacá, the participation of national production of 84.8% with601,419 tons through 84 producer organizations is evident. (Secretary of Agricultural Development of Boyacá, 2018), generating an important dynamic in the generation of income of 25% (Asohofrucol, 2018), the municipality of Duitama concentrates a good part of the production of vegetables, which is why a group of producers consolidates anassociation for horticultural production and marketing, presented a lack from the socio- organizational management since it only has 22 producers which show weaknesses within the association, generating among them distrust, lack of credibility and commitment on the part of the associates. Similarly, there are shortcomings in marketing and innovation strategies, since they do not have knowledge related to this issue and therefore have to goto intermediaries to position the product to the final consumer, in addition to this the ignorance on the part of consumers of the Association since it does not have marketing strategies that show the association.

**Knowledge Management**

The first authors to talk about Knowledge Management are related in the era of the 80-90 where different perspectives of total quality, continuous innovation and organization are interpreted, this

was generated in the private sector of organizations, carried out by a privatecompany called Digital Equipment Corporation and by Technology Transfer Society at Purdue University in 1987 (Beazley et al, 2013).

On the other hand, at the personal level and systematic development of organizations, PetterDucker is evidenced in 1993 as the pioneer of talking about knowledge and human capital, where he expresses the importance of training and teachings of the people who present themselves in an organization.

Based on this classification (Nonaka and Takeuchi, 1995) they propose a model of knowledgecreation taking into account two dimensions: the ontological dimension, which refers to the levels at which knowledge interacts and extends (the individual, the group, the organization and/or the interorganization), and the epistemological dimension, which distinguishes between tacit knowledge and explicit knowledge. The key to his model is the definition of four knowledge conversion processes that occur when tacit and explicit knowledge interact,capture or are shared:

1. Combination (conversion from explicit to explicit): It is a process of systematization of concepts with which a knowledge system is generated. It involves combining different bodies of explicit knowledge into more complex sets of explicit knowledge. The use of computerized communication networks and large-scale databases facilitates this form of knowledge conversion.
2. Internalization or internalization (conversion from explicit to tacit): It is a process bywhich explicit knowledge is expressed as tacit knowledge. This category of conversion is closely related to "learning by doing", training and exercises. It is helpful if knowledge is verbalized or schematized through documents, manuals or oral histories. Documentation helps individuals internalize their experiences, enriching their tacit knowledge.
3. Externalization or externalization (conversion from tacit to explicit): It is a process that requires the expression of tacit knowledge in the form of explicit concepts. Tacitknowledge is personal, it depends on the experiences of the person under certain conditions. As a consequence, it has a contextual component. Externalization includesthe transformation of facts based on a context to knowledge without context, with thehelp of metaphors, analogies, concepts, hypotheses and models. Once made explicit,knowledge can be freely distributed within the organization. Dialogue and collectivereflection often provoke this process.
4. Socialization (conversion from tacit to tacit): It is a process of exchange anddistribution of experiences, such as mental models or technical skills, by which new tacit knowledge is created. This mode of conversion requires individuals to interact with each other, however, this interaction can take place without using language, for example, through observation, imitation, and practice. Shared experiences in which individuals can identify with one another and incorporate each other's feelings and beliefs foster the socialization process.

**Knowledge management models in the rural sector**

Within the knowledge management models are the following

**Knowledge management model of Koulopoulos and Frappaolo (2000)**

This model used by (Urbáez & Omaña, 2011) in the research Knowledge intermediation: process of

knowledge management in Venezuelan agricultural cooperatives, in which it is mentioned that the organization must promote an encounter between knowledge and people and connect the knowledge seeker with the optimal source for that search engine. The knowledge management processes of this model are:

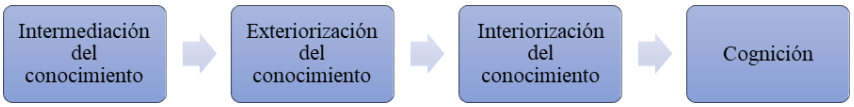



Figure 3. Model knowledge management processes

In this context, the authors propose that the intermediation of knowledge can be of two types:
Asynchronous: It is characterized because externalization and internalization do not occur simultaneously (asynchrony). Here external databases become important, in which knowledge and information about the owners of knowledge is classified and stored and correspond to the source from which individuals extract relevant explicit knowledge even before a need or problem arises to be solved within the organization.
Synchronous intermediation This type of intermediation occurs when externalization and internalization occur simultaneously. The primary function of the organization is focused on connecting the supplier with the knowledge seeker. In this case the knowledge is not stored, but transferred by direct communication.
For this model, the following was taken into account:
Number of holders of tacit knowledge
Knowledge Storage Bank
Knowledge transfer through direct communication
Informal grouping of individuals united by a common interest
Connection of the knowledge seeker with the knowledge provider (Urbáez & Omaña, 2011).

**Knowledge management model proposed for the dairy production chain in Colombia**
According to (Simanca et al., 2016) the model shows that the concept of productive chainis more than a link between the actors of a productive sector and that it involves actorsfrom the state and the academic environment, among others; and that for an adequatemanagement of knowledge in these productive chains, it is necessary to have clarity aboutthe facilitators and the functionality of the process of knowledge management in interorganizational contexts as a specific strategy to build or improve the competitivenessof the chain.
For the analysis of knowledge management in production chains, a theoretical model was proposed that defines knowledge management as independent and competitiveness as dependent as shown in the following Figure:

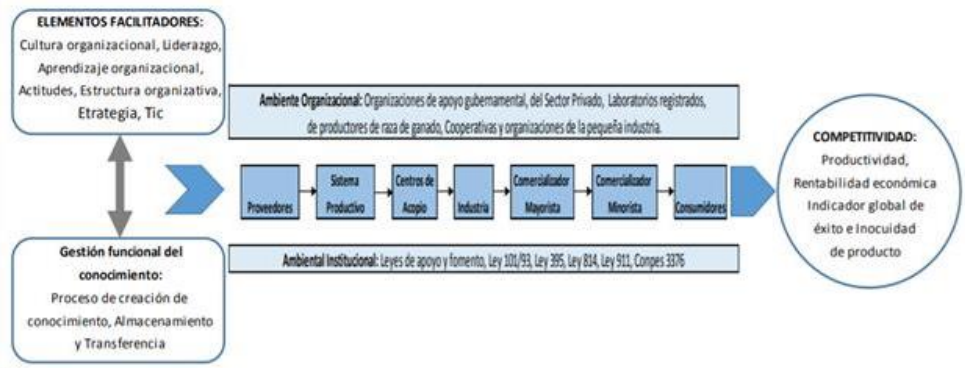



Figure 4. Knowledge management model for the dairy production chain in Colombia

The systemic relations of cooperation between the actors of the links of a production chainand other agents or actors of society and not the individual action of each company is the key factor for the construction of competitive advantages in the productive sectors. The new forms of cooperation (production chains) in the era of globalization are a complex but

effective strategy, which transcend the borders of companies and the business sector itselfto respond competitively to the demands of the current economic order.

Thus, the trends of flexibility in production systems require the linkage of the actors of the productive sectors which require the articulation of their activities and the articulation of their activities with state entities, academia and other social actors to guarantee their sustainability both as an actor and as a productive system.

In knowledge management, facilitating elements such as:


Figure 5. Knowledge management enablers

Among the advantages of the proposed model is the measurement of the impact of facilitating and functional elements of the knowledge management process on the competitiveness of the chain and each of its links.

Likewise, the limitations are the measurement of variables only through the collection of data through surveys, and not through indicators of intellectual capital such as the balanced scorecard; and the existence of few proposals for measuring knowledge in interorganizational environments with which to compare the proposed model (Simanca et al., 2016).

**Knowledge management model supported by technological surveillance and competitive intelligence for production chains in the Valle del Cauca Bioregion**

(Galeano et al., 2011) propose a model of KM replicable in production chains in the region,which is conditioned by the environment (understood as market trends and demands that continuously evolve towards constant demand at high levels of competitiveness), and responds to this environment through strategic knowledge management deriving thefollowing stages:

Identification of knowledge and diagnosis of the production chain under investigation. Generation of the knowledge necessary to reach stages of competitiveness demanded by the trends and demands of the environment. Capture and storage of knowledge supported by ICTs and Social Networks. Access and Social Appropriation of Knowledge through the Implementation of "Innovation Systems"; and Application and use of intellectual capital that in the case of the IsabeIla grape production chain was directed to the Safety AssuranceSystem.

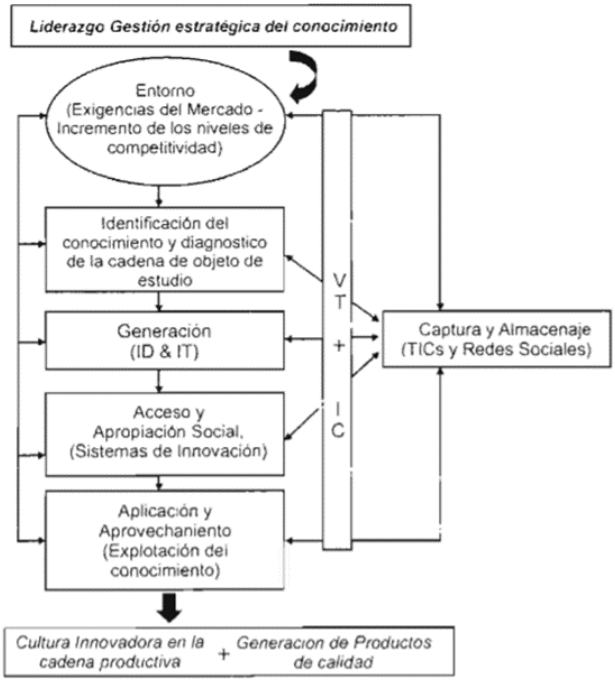



Figure 6. Knowledge Management Model for the production chains of the Valle del Cauca Bioregion

## DIMENSIONS OF KNOWLEDGE MANAGEMENT

As for the first dimension, information from the internal market is collected, it involves identifying possible improvements through activities such as the exchange of values and the recognition of internal segments with similar characteristics and needs. Equity theory suggests that employees evaluate their jobs by comparing what they contribute to firms relative to what they receive from them (Huseman and Hatfield, 1990); That is why it is important to know what employees expect from the company, because if the balance of both parties is not balanced, the results will not be satisfactory.

The second dimension is to communicate that information internally. The concept of internal communication is broad and ranges from employee needs to strategic goals and objectives (Grönroos, 2000).

Finally, the third dimension involves responding to the needs identified, once intelligence has been developed from information and knowledge (Nonaka and Takeuchi, 1995). It consists of factors such as management's interest in its employees, training and work-life balance (Gounaris, 2008, Clark, 2001, Kossek and Nichol, 1992).

Currently, according to Laudon and Laudon (2008), the boom in the development of information systems has generated greater growth and competitiveness in organizations by supporting business processes, information processing activities and management activities, which

opens up countless possibilities to expand relationships between customers, suppliers and employees, and enables rapid responses to changes in the environment (Aguilera and Riascos, 2009).

However, in a study conducted by Piattini (2007), based on the so-called software engineering crisis, it was determined that 23% of information systems developments fail, in contrast to 49% whose development is questioned and with only 28% delivered satisfactorily. This has led organizations to worry more and more about the economic losses caused by therisks caused both by the very nature of information systems and by the lack of quality in theirdevelopment.

At this point, not only the use of the active variable of digital marketing is based but in the management of risks and controls in information systems, has an essential role in the protection of risks related to information systems, by providing organizations with capabilities to: align risk levels with their organizational impact and return on investment, Optimize decision-making and minimize losses.

The main objective of business management in ICTs, within an organization is to protect its business processes and its ability to fulfill its mission. Therefore, it should not be treated only as a technical function performed by the information technology experts who manage information systems, but as an organizational task that requires a much more complex perspective than that given from hard thinking (Adams, 2005) and that includes systems of human activity, which are responsible for their use and development throughout the life cycle.

The soft systems methodology has been involved in information systems studies through the process of action research in organizations in recent years, in order to support the discipline from the organizational perspective (Checkland and Poulter, 2006). This implies taking into account the sociocultural, political and administrative factors that often tend to be minimized or excluded (Checkland, 2000b; Checkland and Holwell, 1998). The central ideabehind the work described by Checkland and Holwell is that the conceptual models developed at the MSB can be used to initiate and structure discussions about the informationsupported by the activities that people perform in the real world, a process that is usually known as requirements analysis. During the development of these systems, (Checkland and Griffin, 1970) they designed the first conceptual model to determine the information needs of a medium-sized textile company. Since then, studies such as that of Gómez and Olave, 2007 have made it possible to relate systems thinking in general and MSB in particular to thefield of information systems (Checkland and Scholes, 1999).

Contemporary authors such as Cater-Steel and Ka-WaiLai, among others (Cater-Steel and Al-Hakim, 2009), provide a look at the application of soft systems methodologies to the maintenance and development of information systems. Most of these perspectives indicate that in recent years the development of information systems has been increasing, in such a way that they have supported organizational change from the point of view of functionality, flexibility and availability of information. However, information systems are not exempt from errors and / or changes in the operating environment to which they provide service, so it is necessary to periodically carry out evaluation studies of the risks to which they are exposed, in order to generate controls that allow to reduce the cost associated with the loss of information and computer resources.

From the part of the agricultural sector and the importance of research and the knowledgesector, the relationship of information needs and information behavior of farmers was made in 1985 in Nigeria by Lenrie O. Aina, who determined that the most important topics on which this group of people need information are "irrigation techniques, fertilization techniques, equipment for

ploughing, cultivation and harvesting, weather, climate, meteorology, cultivation techniques according to the species of plants, pest and pesticide control" (Aina, 1985: 38). Subsequently, Nason (2007: 20) mentions the following:

> "Farmers in the development of nations have needs similar to those of their American counterparts such as the type of soil of the fields, the climate and the need to access agricultural technology, as well as obtaining credit and the price market."

Because of the development of agricultural systems and their importance in the resources to which farmers resort from electronic and information points, according to Nason (2007, 22), they are "electronic sources (Plants, Agricultural, among others), radio and television, publications for farmers and farmers, libraries, cooperative services, experimentalstations".

Since 2010, the interest group of the agricultural libraries of the International Federation of Library Associations and Institutions (ifla), in conjunction with the International Association of Agricultural Information Specialists (IAALD), establishes that the information needs of farmers revolve around the issues of fertility and soil erosion, Climatic conditions, fertilizers, pests, weed control, water management, agricultural credits, what to do after harvests, transport, marketing, among others (IFLA, 2010).

One of the main concepts of innovation has been approached from various perspectives. In general, evolutionary economic theory considers innovation as the application and use of new ideas, concepts, products, services and practices, with the intention of being useful in increasing productivity, and takes place mainly in the company. Thus, innovation is inserted in market processes, since it is these processes that determine the profits to innovation and generate resources for innovation; but they also have a strong relationship with science and technology developed by universities, research and development centers (R+D) and laboratories. So innovation is the intersection of science and technology systems (CyT) with market processes (Metcalfe and Ramlogan, 2008).

## AGRICULTURAL ASSOCIATIONS

The theory of associativity is important to achieve the competitive growth of companies, due to the integration and cooperation between them, with the aim of achieving agreements, growth of and growth of markets. (Camac et al., 2021) in the same way (Alba et al., 2018) defines it as "as a mechanism of cooperation between producers, which can be natural persons or small and medium-sized enterprises, where each of those linked to the association maintains administrative independence and strategic competence, but all share a common purpose in the search for better conditions to participate in markets that have become highly competitive" (p.48). of equal This author mentions that this theory is important as "a collective strategy, allows solving common problems while maintaining the managerial independence of the associates, has a voluntary character, is inclusive since it does not limit access, allows the adoption of various legal and organizational forms, focuseson models for small businesses or small business owners" (Alba et al., 2018), in the same way (Guerrero et al., 2021) mentions some characteristics of the associative conceptthighlighting them as a voluntary mechanism where participants are invited to participate, it is also seen as a collective strategy, it does not exempt any type of company, it is important for the resolution of joint problems designating autonomy in the managerial part,it is important for economic

growth for small companies. In the same way, this author mentions that the associative process is divided into the following stages. "Gestational stage, structuring stage, maturation stage, productive stage and decline stage" (p.464).

## METHODOLOGY

The proposed methodology was developed through a qualitative approach which was carried out in three phases.

**First phase.** It was carried out through a documentary analysis, which constitutes the pointof Entrance to research and even, in many cases, is the origin of the topic or research problem. Source documents can be diverse in nature: personal, institutional or group, formal or informal. Through them it is possible to obtain valuable information for research (Quintana Peña, 2006). In this way, aspects were identified to know the panorama of knowledge management in the agricultural sector at the global and national levels; In addition, a search was performed in the Web of Science® database because it is considered as an analysis tool that presents statistical data of citations from 1997 onwards, providing an overview of the importance of journals within their thematic categories (impact factor of journals). With more than 8,500 publications from around the world, this tool offers data to classify authors, institutions, nations and publications (FECYT, 2021).
Subsequently, the following search equation is designed: ("model" * OR "management techniques" OR "marking decisions") AND ("knowledge management" OR knowledge) AND (Agricultural sector) from which filters were considered for the respective analysis such as: document type, articles, countries such as the United States, United Kingdom, India, Italy, Germany, Brazil, Colombia, Chile and Venezuela. (135;98;87;67;64;34;15;7;4) research areas such as social sciences, agriculture, administration, computer science, and economics (14.2%;19%;5.2%;5.1%;3.5%)and time period, corresponding to the last five years where 67 documents were found in 2018, 2019 104, 2020 121 and 2021 118 and types of documentsrelated to the topic to be investigated, articles were found, Publishers, books, and review (67.8%;0.3%;1.1%,10.5%).

**Playoff.** For the development of this section, the Wiig Integral Knowledge Management Model (1993, 1988) was implemented, which "is based on the creation, codification and application of knowledge according to the needs and availability of this" (González, Rodríguez and González, 2014.p.86), this model presents as phases the Collection of information through a diagnosis, Share knowledge that focuses on the preparation of training actors and the application of knowledge for the resolution of organizational problems, focusing on the identification of organizational knowledge needs and availabilityof implementation in associations.
For the generation of the Knowledge Management Model, a qualitative approach was implemented with a non-experimental descriptive exploratory research design of a cross- sectional focus group. To carry out this process, the Participatory Rural Innovation Model (IRP) was developed, which is defined by (Gutiérrez, 2010,) as "The IRP method consists of a sequence of steps to carry out a social intervention based on participation and sustainability" (p. 526), this methodology is important since it involves small producers, in this case, rural horticultural associations to be promoters of "local development, raising their self-esteem, enhancing their management capacities, promoting their autonomy andstrengthening their productive skills" (Gutiérrez, 2010, p.527).

**Third phase.** As a last phase, an analysis of the licker instrument and the knowledge management models was carried out in order to build and socialize the model to be proposed to the associations under study.

## RESULTS

## CONSTRUCTION OF THE AGRICULTURAL KNOWLEDGE MANAGEMENT MODEL INCOLOMBIA

### Theoretical bases of the knowledge management model proposed for the agricultural sector

Knowledge management for Ruggles (1998) Knowledge management (QM) is an approach to creating or adding value from leveraging know-how, experience and judgments that existinside and outside the organization. On the other hand, Barragan (2009) identifies knowledge management as the set of individual or collective skills that allow transferring information in the form of knowledge and transforming that knowledge into the experienceof organizations and individuals.

For (Rodríguez), knowledge management can be defined as the set of systematic processes (identification and capture of individual capital, treatment, development and sharing of knowledge and its use) "oriented to organizational and/or personal development and, consequently, to the generation of a competitive advantage for the organization and/or theindividual" (2006, p. 29).

There are various techniques and tools for knowledge management, among which the massive contribution of ideas, communities of habit, frontal interactions, project reviews, mentoring and learning stand out; likewise, within the tool are the grupware, intra networks, knowledge bases, instant sending of messages, text data, among others (Pérez, 2016) cited by (Gonzales, Rodriguez, & Gonzales, 2019)

Despite the existence of countless models for knowledge management, the review of someof them and the specialized literature in this field (Davenport and Prusak, 2001; Davenport, De Long and Brees, 1997; Wiig, 1997; Rivero, 2002; Alavi and Leidner, 1999), allows them to be grouped into three types: Storage, access and transfer of knowledge, Sociocultural and Technological (Rodríguez, 2006)

### Organization of the knowledge management model for the agricultural sector.

To carry out this process, the Participatory Rural Innovation Model (PRI) was implemented,which is defined by (Gutiérrez, 2010,) as "The IRP method consists of a sequence of steps to carry out a social intervention based on participation and sustainability" (p. 526), this methodology is important since it involves small producers, in this case, associations of the rural agricultural sector to be promoters of "local development, raising their self-esteem, enhancing their management capacities, promoting their autonomy and strengthening their productive skills" (Gutiérrez, 2010, p.527).

This phase of the research was developed in the following stages taking the knowledge management model of (Báez, Hernández and Perdomo 2018).

1. Stage and diagnosis of needs which was developed in order to know the relevant information for the creation of the proposals of the knowledge management model,to carry out this process the Participatory Rural Innovation Model (IRP) was implemented which is defined by (Gutiérrez, 2010,) as "The IRP method consists of a sequence of steps to carry

out a social intervention based on participation and sustainability" (p. 526), this methodology is important since it involves small producers, in this case rural agricultural associations to be promoters of "local development, raising their self-esteem, enhancing their management capacities, promoting their autonomy and strengthening their productive skills" (Gutiérrez, 2010, p.527).

2. Stage of preparation of training actors. It is developed in order to prepare the process of the knowledge management model based on the results of the diagnosis,for this it was necessary to develop the following steps.
    - Selection and preparation of support staff to act as facilitators, which was counted with graduates of the Agricultural Business Administration program and research seedbeds.
    - Selection of the topics that will be developed according to the diagnosis which were worked business management, agricultural marketing strategy and technological information systems.
    - Creation of the conditions for the development of the topics for the generation of the knowledge management model.
3. Stage of execution of training and knowledge management actions

    For this phase, the training model in productive activity was implemented, developing under the following actions:
    - Location of work teams
    - Development of training activities.
    - Development of evaluation actions
    - Evaluation of the development of Knowledge Management activities.

With the development of this phase, business management, marketing and innovation and technological development strategies were built.

**Phases to build the proposal**

In this section, the knowledge management model for the horticultural associations of the municipality of Sogamoso is built based on the knowledge management model for local agricultural development by (Hernández, et al., 2018)

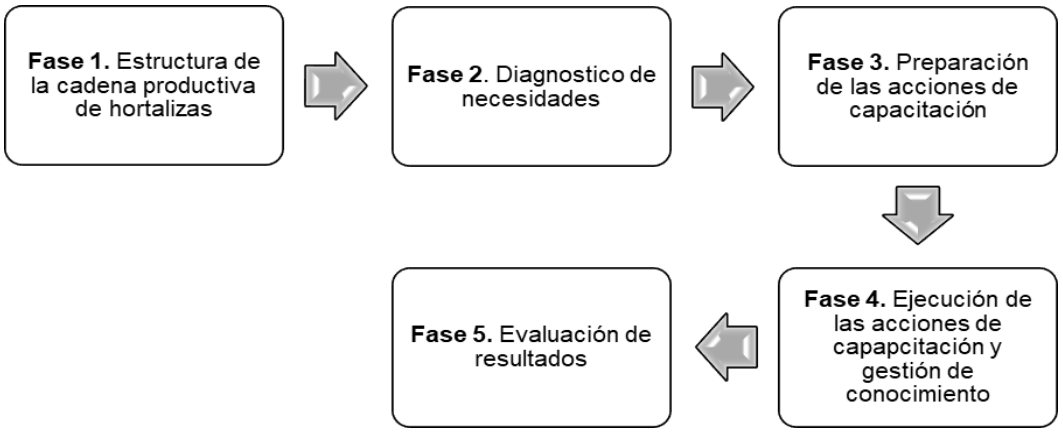



Figure 6. Phases of the knowledge management model. Source: (Hernández, et al., 2018)

**Phase 1. Structure of the production chain.** The main functions identified in the vegetable chain are suppliers and inputs, production, collection and marketing. Processing is an unrepresentative function in the horticultural chain of the municipality of Sogamoso. The main operators for input suppliers are the small horticultural producers of the association, as well as in production. Regarding the link of collection and marketing, its main operators are local or community buyers.

**Phase 2. Diagnosis of needs.** The essential objective is to know all the information necessary for an objective knowledge management proposal. For this, methods such as documentary review, observation and surveys or interviews were used. The relevance of knowledge management depends on identifying problems and potentialities that exist. As a result, actions need to be undertaken to: know the priorities of the association that allow the organizers to guide and direct knowledge management actions towards organizational needs, identify the potentialities of the territory that serves as a starting point to work for local agricultural development and organize knowledge management; characterize the agricultural units to know the soil, water potential and physical-geographical conformation,

which makes it possible to adapt knowledge management to the context and identify the real conditions for the training of local actors in each scenario; identify the programs and projects to be implemented in the productive scenario so that with this information decidethe topics that respond to the knowledge management needs of the actors, which makes it possible to design training actions with greater objectivity, relevance, efficiency and effectiveness (Hernández, et al., 2018).

**Phase 3. Preparation of training actions**. It aims to prepare the knowledge management process based on diagnostic information. Actions are developed such as: a) Selection of facilitators: taking into account professionals to carry out the training b) Preparation of facilitators: taking into account the diagnosis, the areas with the most needs are enhanced.
c) Selection of topics that will be taught according to the diagnosis of needs of theassociation: once selected and prepared in coordination, the topics to be developed are determined.

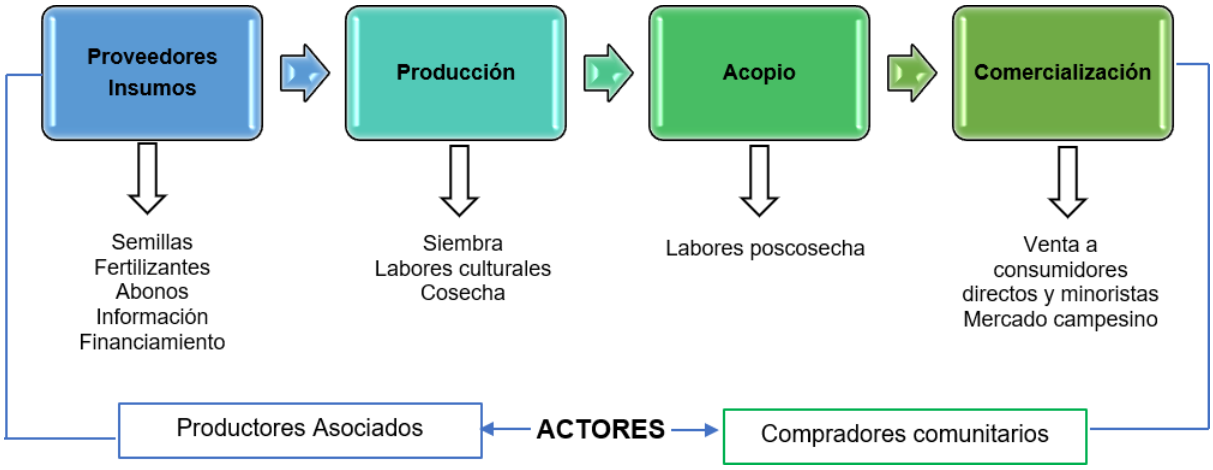
**Phase 4. Execution of training and knowledge management actions.** It aims to implement the actions. It considers the general principles stated to be observed in the operation of the model, its basic requirements and the approaches and forms envisaged for knowledge management. As the main organizational form, the workshop-class should be adopted, so that practice and theory complement each other. It is recommended to use the method of training in productive activity (Mena, 2008) so that the actors internalize the technique and technological principles during the execution of the productive activity.
Actions: Organization of work teams, development of didactic activities of training and knowledge management, feedback, conclusions and concerns.

**Phase 5. Evaluation of process results.** It is conceived as a follow-up that assists the implementation of the knowledge, skills and attitudes incorporated by the actors that allows to verify the results achieved gradually. It is an evidence-gathering process that demonstrates the capacities developed by actors to transform their environment. Although it is important to evaluate the final results, the criterion on the total quality of Ishikawa (1981) must be followed, that the quality in the processes guarantees the quality of the products and a criterion of systematicity when considering the evaluation as a process andnot a moment.
Each of the phases of the Knowledge Management Model for 2 horticultural associations in the municipality of Sogamoso, department of Boyacá is described below.
The model is based on two fundamental bases of education that can support knowledge management for local agricultural development. These are: need to develop the management of agricultural knowledge and put the community as the main center of preparation and appropriation of agricultural culture by producers.

The construction of the model starts from the observation of practice, of the real concrete. It allows the conception and study of the research object (knowledge management processfor local agricultural development) because it is the foundation of interconnection of realitywhere producers intervene, the productive-pedagogical context and the academy- university that act as facilitators in training and innovation.

**Phase 2. Diagnosis of needs. Identification of needs of the** Asogranja association of the municipality of Sogamoso through surveys with dimensions based on organizational culture, organizational structure, marketing management and management of ICTs or technological development.

**Phase 1. Structure of the vegetable production chain**




Source: Author, 2021

Table 4. Association diagnosis

| Organizational Culture | Organizational Structure | Marketing Management | Technological development |
|---|---|---|---|
| It was possible to demonstrate strengths in terms of values, beliefs and traditions that are part of the organizational culture, however, small producers must strengthen the management of areas, control of records and planning for the development of productive | activities individually as associative. | There is a greater participation of the female gender in the association which demonstrates the empowerment of rural women, age, academic level and experience are not limiting to belong to the association. On the other hand, it was observed that there are obstacles in terms of training and training tools for horticultural producers. | Producers and associates develop strategies and advertising campaigns to publicize their products based on organic production as a differentiation strategy, likewise through promotions customer loyalty activities are carried out. Otherwise, no records are kept in terms of fixed costs, variable costs and benefit/cost ratio of their products. |

It was evidenced as one of the main shortcomings of the association, from an external and internal context, from the external point of view there is low connectivity in the rural sector therefore there are certain disadvantages in terms of access to technological tools to facilitate the development of activities and access to information. While producers consider that technological platforms are essential for the sector. Shortcomings are identified in terms of the use and ignorance of programs, platforms and applications for the commercializatio n of agricultural products.

Source: Author, 2021

**Phase 3. Preparation of training actions**

(a) Selection of facilitators: taking into account professionals to implement training

b) Preparation of facilitators: taking into account the diagnosis, the areas with the mostneeds are strengthened

c) Selection of topics that will be taught according to diagnosis of needs of the associationTheme

Marketing

Harvest and post-harvest management

Agroindustry

Traceability and coding in the agricultural sector

**Phase 4. Execution of training and knowledge management actions.**

Actions:

Organization of work teams

Development of didactic activities of training and knowledge managementFeedback

Conclusions and concerns.

**Phase 5. Evaluation of process results.**

Monitoring that assists the implementation of the knowledge, skills and attitudes incorporated by producers regarding the topics seen through the formation of friendlier links between agricultural association and academia.

## FINAL DISCUSSION

It is important to highlight in this type of research especially for the agricultural sector, since the situation in the development of processes develops limitations focused on business management, marketing and technological development, which is why an analysis of the different models of knowledge management is made in order to build the most appropriate, taking into account the variables previously subscribed. Therefore, Báez, Gopal and Barrasa emphasize the development of models focused on technology management, on models in areas such as the management of technological knowledge and learning, focused onintellectual capital and knowledge direction.

Similarly, Barragán (2009) states that the studies and applications of knowledge management in recent years have had a significant increase and with it, a significant number of knowledge management models have been generated that aim to understand and explain the function and operation of this concept from various points of view, both theoretical and empirical, in the different specific contexts where these come to be applied for the benefit of individuals, organizations and

society in general. Likewise, Rica (2015), states that models are the instruments or conceptual schemes, through which human beings try to systematically articulate the knowledge obtained from experience, through the research process.

## CONCLUSIONS

Unfortunately, the agricultural sector in Colombia lacks strategies aimed at organizational structure, marketing and technology, which is why this analysis was carried out focused on various studies aimed at knowledge management, where representative authors stand out linking the human component for the development of processes in order to propose improvements and managerial skills, from the different link chains. With this analysis, the design of the management model for this sector of the economy is carried out, in order to implement it in associations of different kinds, and in the same way, contribute to the economic, social and cultural growth of this sector, which is the most important for food security, as evidenced in the health contingency that is currently being experienced.

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