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Analytical model to assess the functionality of small farmers' organizations

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ABSTRACT: The analytical network process (ANP) was used to analyze the functionality of small farmers' organizations; 12 experts were consulted to verify the relevance and assign value comparative judgments to the criteria´s of the internal, external and functional sets. Judgments were added through AIJ technique, after of synthesis weights of relative importance for the criteria's were estimated. The results show that the criteria´s of the internal set are the ones that are most important for the functionality, highlighting the leadership and management capacity, together with the market environment and the achievement of the objectives proposed by the members.

Modelo analítico para evaluar la funcionalidad de las organizaciones de pequeños agricultores

RESUMEN: Se usó el proceso analítico de red (ANP) para analizar la funcionalidad de organizaciones de pequeños agricultores. Se consultó a 12 expertos para verificar la relevancia del modelo y asignar juicios de valor a los criterios de los conjuntos propuestos. Los juicios se agregaron mediante la técnica AIJ; después de la síntesis, se estimaron los pesos de importancia para los criterios. Los resultados muestran que los criterios del grupo interno son los que mayor importancia se atribuye para la funcionalidad, destacando el liderazgo y la capacidad de gestión, junto al entorno de mercado y el logro de los objetivos propuestos.

KEYWORDS / *PALABRAS CLAVE*: Analytic Network Process –ANP–, Associativity, Collective action, Organizational performance, Social capital / *Proceso Analítico en Red –ANP–, Asociatividad, Acción colectiva, Desempeño organizacional, Capital social*.

JEL classification / *Clasificación JEL*: D70, L23, L30, P31.

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1. Introduction

The agricultural producers' organizations participate in increasingly globalized markets, facing highly competitive scenarios. In these contexts, few agents have a high negotiation power (Biénabe & Sautier, 2005) which hinders access to markets, mainly for small-farmers' organizations. In this scenario, actions to strengthen and develop capabilities to the cooperation and coordination among the agents, especially those linked to primary production organizations, are relevant in order to face the competition. Among the benefits attributed to associativity, Collion & Rondot (2001) highlight technical progress, improvement of inclusive businesses, effective management of resources, the supply of services according to needs, and the acquisition of higher negotiation power.

In Colombia, Supersolidaria statistics show that by 2014 there were more than 430 legally constituted cooperatives of agricultural producers, but only 234 of them were in operation (Clavijo *et al.,* 2017). Since the 1980s, public policies of agrarian and rural development have promoted the organization of agricultural producers under associative schemes (Molina & Chavur, 2018; Aranda & Parrado, 2016; Parrado, 2018). However, many of these efforts to promote entrepreneurship and associativity, especially through organizations of small farmers and familiar agriculture, have not reached a successful conclusion and have ended in failure (Parrado, 2018).

To consolidate agricultural producers' organizations and to achieve the contributions attributed to them for the agricultural sector and rural development, it is necessary that their members have the basic capabilities for collective action and the strength to achieve high impact projects (Fischer & Qiam, 2014; Barham & Chitemi, 2009; Shiferaw *et al.,* 2011). In order to achieve this, it is necessary to develop mechanisms that allow their analysis.

In this sense, Table 1 summarizes the evolution of the theories of organizational analysis over time, highlighting their main authors and schools. It should be noted that although recent contributions to the post-structuralist school were studied, only the most relevant theories and contributions of this school are contemplated for this study. It can be seen that in contrast to the technical and productive approach proposed by the authors of the classical theory of the early 20th century, the structural and holistic approaches of the subsequent years gave higher importance to the human and social aspects of the organizations. Likewise, at the level of rural organizations, it is necessary to articulate both technical and social aspects under a holistic model, recognizing the relationship and interdependence between them.

TABLE 1

Approaches and authors of the organization's theory

Approach	Concept	Author(s)	Description
Classic school.	Classic school.	Taylor (1911).	Rationalization and division of labor, specialization of the worker.
		Fayol (1916).	Architecture of coordination and control. Management concept (planning, management, control, direction).
	Scientific management.	Gulick (1920).	Expansion of classical theory by Fayol.
		Urwick (1943).	Comprehensive theory of management.
	Human relationship theory.	Mayo (1945).	Groups of workers: productivity according to their interests. Autonomous behavior of the units controlled by their structure. Social integration of workers.
Human relationship and behavior school.	Needs hierarchy.	Maslow (1943).	Theory of human motivation for work.
	Two factors theory.	Herzberg (1959).	Factors of satisfaction and dissatisfaction and how they help one but not the other.
	General system theory.	Bertalanffy (1993).	General system theory, process, and links between elements.
	Field Theory.	Lewin (1951).	Interaction of groups with the environment.
	Theory X and Theory Y.	McGregor (1967).	Theory X, workers are lazy and need to be directed. Theory Y, dynamic worker who enjoys work, motivation, etc.
	Organizational development.	Bennis (1966).	The organizational development in response to change, aims to change beliefs, attitudes, values and structure of the organization.
	Organizational culture.	Schein (2010).	Organization must be understood as a micro-society with a cultural dimension.
Structuralism.	Structuralism.	(Lounsbury & Ventresca, 2003).	Interrelates organizations with the environment. Society is interdependence of organizations. It considers the effect of reward and material and social sanctions. Open systems (others consider them as closed).
Holistic school.	Neoclassic theory.	Drucker (1986).	Reaffirmation of the classic postulates. Emphasis on the general principles of management (planning, organization, management, control). Emphasis on objectives and results (management by objectives). Eclectic with other theories.
	Situational approach.	Chandler (1962); Burns & Stalker (1961); Woordward (1958); Lawrence & Lorsch (1968).	Expansion of the general theory of systems. Interdependence between the organization and the environment. Adaptation to the environment to survive. Technology that determines organizational characteristics. Organization as socio-technical reality (each one is a subsystem).

Source: Own elaboration.

In consequence, the functionality of agricultural producers' organizations is related to both technical and social aspects under a holistic model, recognizing the relationship and interdependence between them. Hart & London (2005) propose that the successful initiatives of small farmers' organizations are those in which profit maximization occurs to the extent that these are functional, offering solutions to the problems of their members. On the other hand, Bebbington (1997; 1999) suggests that the organizations of more formal and relatively strong agricultural producers are functional insofar as they provide access to knowledge, credit, irrigation, technical assistance, and new markets. This way they do not require of intermediation of commercial actors to expand access to the market, which guarantees that they do not lose autonomy (Bebbington, 1999). Macqueen *et al.* (2006) show evidence that enterprise associations in developing countries are successful and functional when those have strong capacities and use their means to achieve three important ends: reducing transaction costs, adapting strategically to new opportunities, and lobbying for more supportive policies.

Functionality is understood as the set of characteristics that makes something practical and utilitarian (RAE, 2016). It allows to effectively meet the needs of the members with respect to the organization (George *et al.,* 2013), creating affinity and cooperation among them. For an organization to be functional, it must respond to a set of specific functions among its actors through the management of its resources. This should be done in such a way that the collective objectives established are fulfilled, offering at the same time ease, comfort and usefulness to its members.

Based on the organizational constraints described above, numerous researchers have tried to explain why the organizations achieve success or fail to achieve the objectives that have been set for collective action. Despite this, there is no agreement regarding the factors that influence the performance of organizations, and therefore, limit their capability to work in government programs (Ragasa *et al.,* 2012).

In this scenery, it is necessary to advance in rigorous and specific studies, incorporating the organizational theory to identify in a holistic way the factors that influence the organizational functionality. This must be performed in small farmers' organizations, in order to design a model that allows establishing the weight of importance of these elements to propose appropriate actions to strengthen their capabilities, and thus guarantee their perdurability.

2. Methodology

To design the analytical model to establish the functionality of small farmers' organizations, extensive documentary research was carried out using both primary and secondary sources related to theories of the organization. In addition, successful cases of collective action of small farmers' organizations were studied, identifying external and internal factors that directly or indirectly affect functionality. This search focused on scientific articles, books, memories of academic events and statistics of the sector, using as search descriptors: successful collective actions, rural organizations, social

and solidary economy, rural administration, social capital, group theory, relational dynamics, among others.

Once the factors that affect the functionality of small farmers' organizations were determined, the steps of Analytic Network Process -ANP- (Saaty, 1999) were used to model the decision problem and ease the description and analysis. Proposed by Saaty (1980) as a method of solving socioeconomic decision-making problems, AHP has been used to answer a wide range of problems (Lee & Kim, 2000; Ho, 2008). When it is impossible to clearly establish the hierarchy between the elements, because many decision problems cannot be structured hierarchically due to the fact that they involve the interaction and dependence of higher-level elements on a lower-level element (Saaty, 1999), it is convenient to replace the classic AHP by networks using the ANP (Chung *et al.,* 2005; Meade & Sarkis, 1999).

ANP is a method of decision analysis that incorporates qualitative and subjective information. It considers the interrelationships and feedback between the elements that form a network, from which an analysis closer to reality is made (Saaty, 2004; Chung *et al.,* 2005; Meade & Sarkis, 1999). It allows using the value judgments given by experts into evaluation (Carmona Torres *et al.,* 2014; Reina Usuga *et al.,* 2018; Saaty, 2004), to organize and analyze the problem across the weight of importance associated to each one of the elements of the model. The ANP is a coupling of two parts; i) it consists of a hierarchy or network of criteria and sub-criteria that control the interactions in the system under study; ii) it is a network of influences among the elements and clusters (Saaty, 2004).

Among the empirical applications related to agricultural issues that have made use of the ANP, those made for the evaluation of the multifunctionality of agriculture (Parra-López *et al.,* 2008; Carmona-Torres *et al.,* 2014; Carmona-Torres *et al.,* 2016) stand out in the evaluation of sustainability for the design of public policies (Carmona-Torres *et al.,* 2016), in the improvement of the competitiveness of small-and medium-sized enterprises (SMEs) exporting agricultural products (Ada *et al.,* 2013), and more recently in the evaluation of the sustainability of territorial alternative food networks (Reina Usuga *et al.,* 2018). However, in specialized literature, no studies that use the ANP to evaluate the functionality of the organizations of small agricultural producers have been identified. The above is a void that this research seeks to help fill; we seek to quantitatively establish the weight of importance that experts attribute to elements related to internal variables of the organization. Some of these variables explain their functionality and others correspond to the environment where these organizations operate. This way, the process rationality can be improved to raise specific actions leading to the enhancement of the functionality of small farmers' organizations.

The operative process of ANP comprises four major steps (Ada *et al.,* 2013) that we use to reach the aim of this research.

Step 1. Modelization and problem structuring

The problem should be stated clearly and decomposed into a rational system as a network. To construct the analytical model which allows establishing the importance of the elements that influenced the functionality of small farmers' organizations, we selected the main elements proposed by different schools of organization theory, which were presented in the introduction, specifically in Table 1.

The verification in the conception of the model and the distribution of its elements was carried out by consulting experts following the Delphi method (Landeta, 1999). For this, six experts were consulted between October and December 2017, through a written questionnaire that inquired about the logic in the distribution and the relationship established between the elements of the model. In this way, it was possible to better specify the dynamics that surround rural organizations and their functionality. The professional training, affiliation and performance area of the experts consulted in this first phase are summarized in Table 2.

Starting with the first query, the model could be specified and the relationships between elements and clusters of the network could be adjusted. A matrix was created to establish the interfactorial domination, which was again submitted for evaluation to the experts who participated in the debugging of the model. The matrix of interfactorial domination allows determining the influence between the elements by a series of questions which are answered with two numbers: 0 or 1. The "zero" means that the elements do not influence each other, while the "one" means there is influence; this classifies the elements block by block and vertically.

The matrix of interfactorial domination obtained after consultation of the experts is presented in Table 3.

Step 2. Pairwise comparison, supermatix and priority vectors

The ANP is based on deriving ratio scale measurements founded on pairwise comparisons to derive ratio scale priorities for the distribution of influence among the elements and clusters of the network. The inner and outer dependencies of the elements of each cluster and the clusters themselves are pairwise compared. As in the AHP, in a pairwise comparison, decision makers simultaneously compare two elements or two clusters at a time in terms of their relative importance with respect to their particular upper-level element or cluster and express their judgments on the basis of Saaty's scale (Saaty, 1980).

TABLE 2

Description of the experts in the first phase of consultation

Expert	Professional training	Institutional affiliation	Performance area
Expert No. 1.	Economist. MSc in Economy. MSc in Administration. Candidate of PhD in Rural Development.	Universidad Nacional de Colombia. Bogotá campus. Faculty of Agricultural sciences. Department of rural development.	Rural and agrarian politics.
Expert No. 2.	Agricultural engineer. MSc in Agrarian sciences. MSc in Sustentable human development. PhD in Sustentable human development.	Universidad Nacional de Colombia. Bogotá campus. Faculty of medicine. Department of nutrition.	Organization for market access.
Expert No. 3.	Enterprises administrator. MSc in Agrarian sciences. PhD in Rural Development.	Universidad de Córdoba (Spain). Department of rural economy, sociology and politics.	Rural development, agrarian market.
Expert No. 4.	Economist. MSc in Sociology. Candidate of PhD in Agroecology.	Universidad Nacional de Colombia.	Organizations.
Expert No. 5.	Agricultural engineer. MSc in Agrarian sciences and tropical resources management. PhD in Agronomy.	Universidad Nacional de Colombia. Bogotá campus. Faculty of Agricultural sciences. Department of rural development.	Agrarian economy.
Expert No. 6.	Agricultural engineer. MSc in Agrarian sciences. MSc in Rural Development. PhD in Rural Development.	Universidad Nacional de Colombia. Bogotá campus. Faculty of Agricultural sciences. Department of rural development.	Rural development, agrarian and alimentary markets.

Source: Own elaboration.

TABLE 3

Matrix of interfactorial domination

	Cluster	External cluster			Functional cluster			Internal cluster									
	Criterion	C1	C2	C3	C4	C5	C6	C7				C8				C9	C10
	Subcriterion							SC7.1	SC7.2	SC7.3	SC7.4	SC8.1	SC8.2	SC8.3	SC8.4		
External Cluster																	
C1 Inter-institutional Environment		0	1	1	0	0	0			0				0		0	0
C2 Market environment		1	0	1	1	0	1			0				1		1	1
C3 Physical environment		1	0	0	1	0	1			0				0		0	0
Functional Cluster																	
C4 Organizational proximity and cooperation		1	1	1	0	1	1			1				1		1	1
C5 Achievement of objectives		1	1	1	1	0	1			1				1		1	1
C6 Satisfaction		1	1	1	1	1	0			1				1		1	1
Internal Cluster																	
C7. Leadership and direction	SC7.1 Rules	1	1	1	1	1	1	0	0	0	1			1		1	1
	SC7.2 Management							1	0	1	1						
	SC7.3 Resources							1	0	0	1						
	SC7.4 Organiz. Architecture							1	0	0	0						
C8. Members' capabilities	SC8.1 Learning	1	1	1	1	1	1			1		0	1	1	1	1	1
	SC8.2 Innovative									1		1					
	SC8.3 Financial									0							
	SC8.4 Technical									1		1					
										1		0					
										0							
										1							
										1							
										1							
C9 Fulfillment of agreements		1	1	1	1	1	1			1				1		0	1
C10 Effective participation of members		1	1	1	1	1	1			1				1		1	0

Source: Own elaboration.

TABLE 4

Saaty Scale for ANP preference judgments

Numeric scale	Definition	Explanation
1	Equal importance.	Both criteria or compared elements have *equal* importance.
3	Lightly more important.	There is a *weak or moderate importance* of one of the criteria or elements over the other.
5	More important.	There is an *essential or strong importance* of one of the criteria or elements over the other.
7	Much more important.	There is a *very strong or demonstrated importance* of one of the criteria or elements over the other.
9	Absolutely more important.	There is an *absolute importance* of one of the criteria or elements over the other.

Source: Adapted from Saaty (1980).

To issue pairwise judgments, the experts use the Saaty's scale, thus assign relative ratings by the verbal expression of a preference for each pair of elements (Table 4). The descriptive preferences are then translated into numerical values: 1, 3, 5, 7 and 9, respectively, for comparisons between two successive judgments (Zhang *et al.,* 2009).

Once the matrix of interfactorial dominance was established, the second phase of consultation was carried out with 12 experts (Table 5). For this phase, a questionnaire was designed, which was accompanied by the relationship matrix; the experts used the scale of Saaty (1980) to declare the paired preferences between the elements of the model (simultaneous comparison of two elements that belong to the same cluster or particular node). Given that the number of elements that related to the established sets was of 17 elements, a direct rating was used (Bottomley & Doyle, 2001). The consultation was conducted between January and February 2018.

TABLE 5

Description of the experts in the second phase of consultation

Expert	Affiliation	Professional profile and performance area
Expert No. 1.	Universidad Nacional de Colombia. Bogotá campus. Faculty of Agricultural sciences. Department of rural development.	Academic. Agrarian economy.
Expert No. 2.	Universidad Nacional de Colombia. Bogotá campus. Faculty of Agricultural sciences. Department of rural development.	Academic. Rural development, agrarian and alimentary market.
Expert No. 3.	Universidad Nacional de Colombia. Bogotá Campus. Faculty of Agricultural sciences. Department of rural development.	Academic. Agrarian and rural politics.
Expert No. 4.	Universidad Nacional de Colombia. Bogotá campus. Faculty of medicine. Department of nutrition.	Academic. Organization for market access. Food and nutritional safety.
Expert No. 5.	Universidad Nacional de Colombia.	Researcher. Sociology and organizations. Candidate of PhD in Agroecology.
Expert No. 6.	Universidad de Córdoba.	Researcher. Rural development, agrarian market. PhD Rural Development.
Expert No. 7.	Universidad Nacional de Colombia. Bogotá campus. Faculty of Agricultural sciences. Department of rural development.	Academic. Perennial crops.
Expert No. 8.	Federación Nacional de Cacaoteros Fedecacao.	Union leader. Cocoa organization and production.
Expert No. 9.	Gobernación de Cundinamarca. Agriculture secretary.	Specialized professional. Producer's organization.
Expert No. 10.	Universidad Nacional de Colombia. Bogotá Campus. Faculty of veterinary medicine and animal science. Department of animal production.	Academic. Agrarian politics and agricultural management.
Expert No. 11.	Universidad Nacional de Colombia. Medellín campus. Faculty of Agricultural sciences. Department of forest sciences.	Academic. Agrarian strategy and innovation.
Expert No. 12.	Universidad Nacional de Colombia. Medellín campus. Faculty of mines. Department of organizational engineering.	Academic. Organizations, competitivity.

Source: Own elaboration.

Step 3. Super-matrix formation and synthesis

Saaty (2004) states that by means of a super-matrix, it is possible to capture the transmission of influence along all paths defined in the network and obtain the overall weights of the elements. A super-matrix is a partitioned matrix in which each segment represents a relationship between two nodes (components or clusters) in a system (Meade & Sarkis, 1999). If the components of a decision system are C_k, $k = 1, \ldots, n$ and each component k has m_k elements, denoted by $e_{k1}, e_{k2}, \ldots, e_{kmk}$, a standard form of a super-matrix is [1] (Lee *et al.,* 2008).

$$W = \begin{array}{c} \\ c_1 \\ \vdots \\ c_k \\ \vdots \\ c_n \end{array} \begin{array}{c} \begin{array}{cccccc} c_1 & \cdots & c_k & \cdots & c_n \end{array} \\ \begin{bmatrix} w_{11} & \cdots & w_{1k} & \cdots & w_{1n} \\ \vdots & & \vdots & & \\ w_{k1} & \cdots & w_{kk} & \cdots & w_{kn} \\ \vdots & & \vdots & & \\ w_{n1} & \cdots & w_{nk} & & w_{nn} \end{bmatrix} \end{array} \qquad [1]$$

In the super-matrix above, w_{k1} is a block matrix that represents the relative dominance of the cluster k candidates with respect to each cluster 1 statement. An eigenvector can be obtained with a pairwise comparison matrix of the row components with respect to the column component. This process allows rising to an eigenvector for each column block. For each column block, the first entry of the respective eigenvector is multiplied by all the elements in the first block of that column, the second by all the elements in the second block, and so on. Thus, the blocks in each column of the super-matrix are weighted, and the result is known as the weighted super-matrix that is stochastic (Chung *et al.,* 2005). To yield the cumulative influence of each element on every other element with which it interacts, the super-matrix is raised to limiting powers (Saaty & Vargas, 1998). The limit super-matrix has the same form as the weighted super-matrix, but all the columns of the limit super-matrix are the same. If each block of this super-matrix is normalized, the final priorities of all the elements in the matrix can be obtained.

A reciprocal value is assigned to the inverse comparison; that is, $a_{ij}=1/a_{ji}$, where a_{ij} (a_{ji}) denotes the importance of the i^{th} (j^{th}) element. Like AHP, pairwise comparison in ANP is performed in the framework of a matrix, and a local priority vector can be derived as an estimate of relative importance associated with the elements (or components) being compared by solving the Equation 2 (Dagdeviren & Yuksel, 2007).

$$A*w=\lambda_{max}*w \qquad [2]$$

Where A is the matrix of pairwise comparison, w is the eigenvector, and λ_{max} is the largest eigenvalue of A.

Saaty (1980) proposes several algorithms for approximating w. In this study, the following three-step procedure is used to synthesize priorities (Chung *et al.,* 2005):

1. Sum the values in each column of the pairwise comparison matrix.

2. Divide each element in a column by the sum of its respective column. The resulting matrix is referred to as the normalized pairwise comparison matrix.
3. Sum the elements in each row of the normalized pairwise comparison matrix and divide the sum by the elements in the row. These final numbers provide an estimate of the relative priorities for the elements being compared with respect to their upper-level criterion. Priority vectors must be derived for all comparison matrices.

Since the evaluation incorporated several experts and the judgments of each one had the same importance, it was necessary to add the judgments to build the super-matrix prior to the synthesis of the model. For this, individual judgments were added trough geometric mean, following the technique (AIJ), technique is used when the individuals act as a synthetic unit (Forman & Peniwati, 1998) and assumes the same weight for each expert judgment. The formula used to add individual judgments was [3]:

$$(A_{Gr}) = a_{ij\,Gr} = \sqrt[n]{\prod_{k=1}^{n} a_{ij\,k}} \quad [3]$$

Where: $a_{ij\,Gr}$ is the average judgment of the alternative *i* with respect to *j* expressed by the members of the group. Thus, a_{ij} is the judgment of each of the individuals who belong to the group on the local priority of the alternative *i* with respect to *j*, with respect to the node to which it corresponds.

Once the judgments were added, a super-matrix was built, from which the weight of importance $w_{L(i)gr}$ was calculated using the eigenvector method proposed by Saaty (2004), allowing to establish the importance of each of the elements of the network. In relation to the nodes with hierarchical dependency relationship, their local weight of importance were calculated following the AHP method (Saaty, 1980), measuring the local weights obtained to know the overall relative importance of these elements compared to the other constitutive elements of the model, after their synthesis. In all cases, the consistency and coherence index was calculated to verify the confidence level of the aggregate matrix of judgments of the consulted experts, verifying that it were less than 10 %. The analysis of the data was performed through the software Super decisions

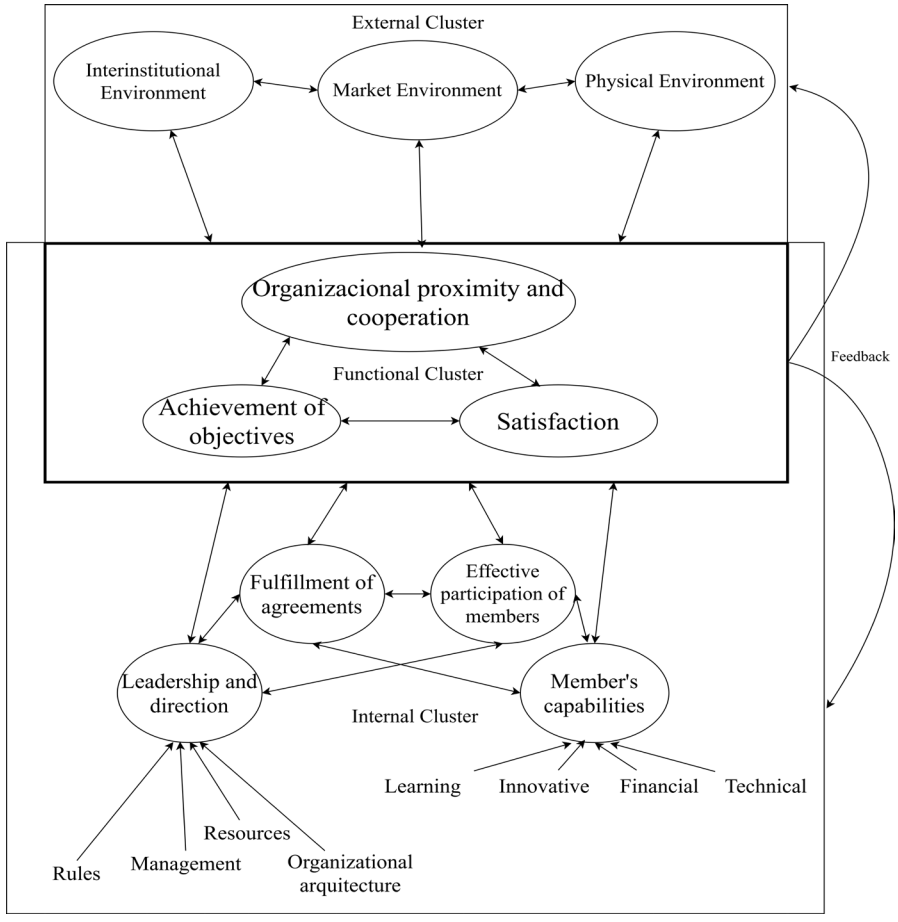
3. Results and discussion

Figure 1 illustrates the proposed analytical model which includes 10 criteria distributed into three large groups that feed each other: the *internal cluster*, which groups all the elements of the organization; the *external cluster*, in which all the elements outside of it interact; and the *functional cluster*, which is the product of the interaction between the internal and external clusters. Within each of the sets, the elements present a series of bidirectional relationship flows, reflecting the interdependence of the elements. Likewise, the elements of the internal and external clusters are connected to the functionality set in a unidirectional way, from which feedback

is created. Within the internal cluster, two of its elements (leadership and direction, and member capacities) presented special importance when validating the proposed model before the experts. For this reason, a hierarchy subdivision was made to address the elements of the internal cluster in greater detail. In this case, the elements that correspond to the nodes do not show any relationship with the other elements of the model, thus presenting a unidirectional relationship only with the element they make up.

FIGURE 1

Analytic model for organizational functionality



Source: Own elaboration.

The consensus of experts for determining the weight of the elements is summarized in Table 5. At the sets level, it is evident that more than 50 % of the weight of the model corresponds to the elements of the internal cluster, followed by the functional cluster set (31.28 %) and the external cluster (16.9 %). These results contrast with the perception of several authors, which positions external factors as determinant for organizational functionality, and shows the importance acquired by the proper work and supervision of the internal functions of the organization.

TABLE 5

Final weights of the elements model to analyze the functionality of agricultural producers' organizations

Criteria		Weight of elements (W_{GI})
External Cluster		**0.169**
C1	Interinstitutional environment	0.043
C2	Market environment	0.077
C3	Physical environment	0.048
Functionality Cluster		**0.313**
C4	Organizational proximity and cooperation	0.095
C5	Achievement of objectives	0.132
C6	Satisfaction	0.086
Internal Cluster		**0.518**
C7	Leadership and direction	0.161
SC7.1	Rules	0.021
SC7.2	Management	0.074
SC7.3	Resources	0.042
SC7.4	Organizational Architecture	0.024
C8	Members' capabilities	0.095
SC8.1	Learning	0.028
SC8.2	Innovative	0.028
SC8.3	Financial	0.016
SC8.4	Technical	0.022
C9	Fulfillment of agreements	0.136
C10	Effective participation of members	0.126

Source: Own elaboration.

3.1. Elements of the external cluster

The ***inter-institutional environment*** refers to the institutions and other organizations that interact with the agricultural organization. It is the element with the least weight in the external clusters, although its importance lies in the ease it offers to disseminate and adopt technologies (Rodríguez Herrera & Alvarado, 2008), and access to markets and specialized technical assistance (Markelova & Mwangi, 2010; Schermer *et al.,* 2011). This contrasts with the general view of rural organizations in Colombia, which give greater importance to entities with which they can develop some type of bond or relationship.

In contrast, the element that gets special importance within the external cluster is the ***market environment***, since it is the base element for the organizations to be self-sufficient and have continuity in their management. It is defined as the entities and actors the organization relates and interacts with in order to enter and continuously participate in the markets to which its product is oriented, its importance lies on its ability to achieve commercial alliances that recognize the added value in its products (Ramírez, 2017). This influences the financial self-sustainability of the organization positively, as well as the satisfaction and commitment of members to the organization (Atterton, 2007).

Finally, there is the ***physical environment***, which groups together all those geographical and infrastructure factors that are part of the territory in which the activity takes place, and that condition the production and marketing. Despite the fact that it is constituted by the environmental and biophysical resources on which the productive activity is supported (Pecqueur, 2004; Colletis & Pecqueur, 2005), and that it includes the access roads and the connectivity with the centers of interest of the organization (Torre & Rallet, 2005), this element has a lower weight than the market within the organizational functionality, considering that producing is less problematic than marketing.

3.2. Elements of the Functional cluster

About 40 % of the weight of this cluster is represented by the ***achievement of collective objectives***. Its importance lies in being the starting point for organizational development (George *et al.,* 2013). It is also the element that allows visualizing the reach and development of the proposed goals, generating the guidelines to follow up, and determining if the organization is functioning according to the reason for its creation. Thus, it becomes the axis of collective action and, consequently, the most visible organizational result for producers (Shiferaw *et al.,* 2008). Therefore, in organizations, coherence between the individual and collective objectives becomes essential to simplify decision making processes and the route of action (George *et al.,* 2013).

On the other hand, ***organizational proximity and cooperation*** derive from the organization's ability to coordinate the economic and social interests of its members, and thus reaching social cohesion (George *et al.,* 2013). This is fundamental for

producers to belong to networks that allow them to access the additional resources used to solve their productive limitations (UNODC, 2013). In addition, it is important to promote individual commitment to the organization, which can also improve the level of cooperation (Dávila, 2004). That is why the affinity among the members of the organization is necessary for the economic, technical and social aspects (Torre & Rallet, 2005). Likewise, it is desirable that members have experience in collaborative work, which eases the development of interactions in other social areas (Gruère *et al.,* 2009; Kristof, 1996; Markelova & Mwangi, 2010), creating cohesion (Aranda & Parrado, 2016; Delery & Shaw, 2001).

Finally, the ***satisfaction of the members*** of the organization refers to the well-being obtained when a collective need has been met; in this case, it has a direct relationship with the capacity of the organization to reach the established objectives and directly affects the level of cooperation of the members. Although for Newbery *et al*. (2013) this element has special importance, the results of the consulted experts show that it has a lower value than the organizational proximity and cooperation, due to the high subjectivity and variability that this element presents among the members. However, it is necessary to understand satisfaction, since the behaviors and motivations of the members of the organization are convenient or beneficial when the organizational performance is satisfactory (Newbery *et al.,* 2013), or vice versa (George *et al.,* 2013).

3.3. Elements of the internal cluster

Compliance with agreements refers to the ability of members and the organization to follow the rules and agreements established when entering the organization. In the case of Colombian organizations, it acquires a special role in the internal cluster of organizational functionalities, since it acts as a source of effective control in the participation of members (Newbery *et al.,* 2013). Therefore, it is necessary that the agreements represent a sufficiently high opportunity cost for producers to avoid passive participation (Grant, 2000; Phillipson *et al.,* 2006). In the same way, it is necessary for the organization to have efficient follow-up and control mechanisms for the fulfillment of its obligations, especially when they undertake commercial actions (Latynskiy & Berger, 2016).

On the other hand, the ***effective participation of the members*** reflects the level of commitment and cohesion with the organization, which encourages organizational strength (UNODC, 2013) and allows the legitimization of the objectives by its members. This is not given only in terms of organizational objectives but is also achieved as part of the associative strength, which encourages the interrelation and exchange of knowledge among members (Schneider, 1994). That is why participation can be altered when there is an impersonal treatment within the organization, which affects fidelity and satisfaction towards the organization (Huertas, 2005).

The ***capabilities of the members*** are a vital element for the success of organizations since they determine the individual performance of each producer in their commitments with the organization. This conditions community work and, there-

fore, the stability of the organization when these capabilities are relatively low (Fischer & Qaim, 2012; George *et al.,* 2013; Hellin *et al.,* 2007; Megyesi *et al.,* 2011; Schermer *et al.,* 2011; Shiferaw *et al.,* 2008). In the case of the organizations of agricultural producers, four types of members' capacities were determined: i) *innovative capacities*: they refer to the capacities to generate new knowledge, develop more efficient processes (economically or technically) or achieve new products. They are closely related to the multiplying effect that the members and leaders of the organization may have. ii) *Learning capacities*: they refer to the abilities to acquire the necessary knowledge for the development of a certain activity, as well as the capacities to guarantee lasting behavior. Their importance lies in the ability to individually and collectively improve productive efficiency, which leads to strengthening the productive base of organizations (Latinsky & Berger, 2016). iii) *Technical capacities*: these are the individual competences or knowledge that influence the productive, technical, logistic and commercial scope of the activity carried out, and affect the efficiency of the use of resources, thus impacting the productivity and profitability of the activity (Vargas & Montoya, 2011). iv) *Financial capabilities*: these are the economic resources that individuals have for the development of their productive activity. In small and medium rural producers, this capacity is directly proportional to the capacity of resilience to new productive scenarios. For this reason, it acquires a decisive role in the adoption and transfer of productive technologies, thus determining the capacity to effectively enter new markets. In this element (capacities of the members), a relatively homogeneous distribution of the weight of the subelements is observed, making the innovative and learning capacities more important. These results coincide with those presented by Vargas & Montoya (2011), which state that in order to achieve efficient collective action, it is necessary to promote permanent technical development of producers through applied educational programs.

Leadership and direction is recognized as one of the pillars for the functioning, competitiveness, and durability of organizations (Narváez, 2014). It is especially important as it is the element with the greatest weight within the internal group. This is due to the fact that it generates social trust among members (Latynskiy & Berger, 2016), making it possible to clarify objectives, define social norms, promote consensus among partners (Narváez, 2014), manage projects and resources, and mediate with other organizations (Huggins, 1998) attracting new members and thereby increasing revenues by keeping costs fixed (Latynskiy & Berger, 2016).

This element is composed of four sub-criteria:

i) *Rules*: They refer to the set of institutions that govern the organization and define the way its members act. They determine the framework to maintain stability and compensate the disturbances during periods of organizational crisis (Machado, 2000). In Colombia, the commercial approach is important for rural producers' organizations, so it is necessary to clearly define the systematic rules of payments, benefits, and dividends (Newbery *et al*., 2013), taking into account technical, social and economic characteristics.

ii) Management: Refers to the way in which the use of resources is planned, executed, controlled, and directed for the development of activities that allow achieving collective objectives. The efficient management of resources offers multiple productive advantages (Newbery *et al.,* 2013), such as the reduction of market uncertainty, stabilization of prices and purchase volumes, and the attenuation of rural restrictions (Shiferaw *et al.,* 2008).

iii) Resources: These are the physical and intangible elements that the organization has for the development of its activities. Their importance is accentuated in small organizations since the liquidity and own capital of both the organization and producers are detailed as two of the main constraints of associations (Latynskiy & Berger, 2016). However, in many cases obtaining resources through grants or donations conditions the financial self-sustainability (Buchanan, 1975), which often affects the ethics, morality and autonomy of the members of organizations (Bennett, 2011). This infers a revision and rethinking of some of the national public policies oriented to the agrarian sector and producer organizations, which encourage associativity through the donation of inputs.

iv) Organizational architecture: It is the structure of power and chain of command established in the organization to achieve the objectives that are set (Machado, 2000). It is necessary to guarantee an efficient model of the organization with defined functions and responsibilities (Taylor, 1911), in which relationships and trust between the members act as an engine. For the proper functioning of the organizational architecture, the members that assume roles in it must have the technical capabilities that each role demands. The leader acquires special importance here since he/she must understand the individual needs of his/her associates. The leader must also offer the same treatment and benefits, even if there are members of different economic, social, political or educational status, avoiding possible divergences in the interests of the members and the board of directors (Herbel *et al.,* 2015; Narváez, 2014; Shiferaw *et al.,* 2008). As the visible head of the organization, the leader gives confidence to its members (George *et al.,* 2013), leads the process of change within the organization (Herbel *et al.,* 2015), and clarifies and encourages development (Altman, 2015).

Although these results support the institutional policy of strengthening the management areas of the organization in areas related to associative work, it is essential that such preparation gets transferred to its members. It is necessary, whenever it is possible, to replace both the members and the board of directors to guarantee the continuity of the organization. Regarding Leadership and Management, it is important to highlight the importance acquired by the management of the organization together with the resources that it possesses. On the other hand, legal and organizational elements, such as the Rules and Organizational Architecture, contribute to a lesser extent to the organizational functionality in spite of being factors that set the guidelines for the allocation of responsibilities and that contribute to the fulfillment of agreements.

4. Conclusions

Functionality is a decisive factor for agricultural organizations since it determines their permanence and development and defines the scope of their objectives and their articulation with the commercial, social and institutional environments.

The developed analytical model, which consists of three clusters and ten elements with individual weights, showed that the elements related to the internal cluster of the organization are responsible for more than 50 % of the functionality. The most important elements are leadership and direction, and the fulfillment of agreements.

In the external cluster, the market environment takes on special importance, as it contributes to the satisfaction of the producers and the financial balance of the organization. In the functional cluster, the achievement of the organizational objectives acquires greater importance for the producers, as long as it expresses a high level of cohesion with the individual objectives. Contrary to what it is expressed in the consulted literature, in the model, the institutional and physical environments have less weight than the market environment, and satisfaction has a lower value than the organizational proximity and cooperation.

It is worth noting that the development of the specific capacities of the members of the organization is important for the functionality of an agricultural organization. Other factors that are relevant are leadership and direction, as well as the permanent availability of resources for the operation of the organization. Finally, the assignment of percentage weights to the elements and sub-elements of the model allows analyzing, evaluating and measuring the level of functionality of the agricultural organizations.

In rural Colombia, despite the heterogeneity of the organizations of agricultural producers, the results obtained reflect the need to plan necessary actions for the strengthening of the management and leadership capacities within the organizations, and in this way, consolidate the bases for the increase of the functionality. However, the results presented in this research have been obtained as a preliminary phase to establish the importance of the elements that condition functionality, according to expert judgment. In a later stage, the results have been used to analyze four organizations of small cocoa producers that develop their productive activity in two territories belonging to the same department. Indicators that reflect the degree of performance of these organizations have been calculated, in relation to the selected variables to explain the degree of functionality; the above will be communicated in another publication.

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APPENDIX 1

Supermatrix of judgments of the group of experts consulted (Consensus on the elements of the model)

Criterion	External set			Functional set			Internal set			
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1. Inter-institutional Environment	–	3/5	1 2/5	1/2	1/4	1/3	1/4	2/5	3/7	1/3
C2. Market environment	1 2/3	–	2 1/6	3/4	1/2	2/3	2/5	7/9	2/3	1
C3. Physical environment	5/7	1/2	–	2/3	1/2	5/8	3/8	1/3	3/7	2/5
C4. Organizational proximity and cooperation	2	1 1/3	1 4/7	–	1	1	5/8	1	4/5	5/7
C5. Achievement of objectives	3 7/8	2	2	1	–	1 2/3	2/3	1 2/3	1	1 1/5
C6. Satisfaction	3 2/9	1 1/2	1 3/5	1	3/5	–	5/9	5/6	3/8	1/2
C7. Leadership and direction	3 7/8	2 5/9	2 2/3	1 3/5	1 4/9	1 4/5	–	1 2/3	1 2/5	1
C8. Members' capabilities	2 3/7	1 2/7	3 1/6	1	3/5	1 1/5	3/5	–	5/9	3/5
C9. Fulfillment of agreements	2 2/7	1 5/9	2 3/8	1 1/4	1	2 3/4	5/7	1 4/5	–	1 1/2
C10. Effective participation of members	3	1 1/9	2 1/2	1 2/5	5/6	2	1	1 2/3	2/3	–

Source: Own elaboration.

APPENDIX 2

Supermatrix of the priorities associated with the elements of the model by the group of experts consulted

	External set			Functional set			Internal set			
Criterion	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**
C1. Inter-institutional Environment	0.04348	0.04348	0.04348	0.04348	0.04348	0.04348	0.04348	0.04348	0.04348	0.04348
C2. Market environment	0.07715	0.07715	0.07715	0.07715	0.07715	0.07715	0.07715	0.07715	0.07715	0.07715
C3. Physical environment	0.04835	0.04835	0.04835	0.04835	0.04835	0.04835	0.04835	0.04835	0.04835	0.04835
C4. Organizational proximity and cooperation	0.09471	0.09471	0.09471	0.09471	0.09471	0.09471	0.09471	0.09471	0.09471	0.09471
C5. Achievement of objectives	0.13188	0.13188	0.13188	0.13188	0.13188	0.13188	0.13188	0.13188	0.13188	0.13188
C6. Satisfaction	0.08670	0.08670	0.08670	0.08670	0.08670	0.08670	0.08670	0.08670	0.08670	0.08670
C7. Leadership and direction	0.16067	0.16067	0.16067	0.16067	0.16067	0.16067	0.16067	0.16067	0.16067	0.16067
C8. Members' capabilities	0.09528	0.09528	0.09528	0.09528	0.09528	0.09528	0.09528	0.09528	0.09528	0.09528
C9. Fulfillment of agreements	0.13477	0.13477	0.13477	0.13477	0.13477	0.13477	0.13477	0.13477	0.13477	0.13477
C10. Effective participation of members	0.12700	0.12700	0.12700	0.12700	0.12700	0.12700	0.12700	0.12700	0.12700	0.12700

Source: Own elaboration.

APPENDIX 3

Matrix of consensus of the judgments given by the group to the Leadership and Direction node

	SC7.1 Rules	SC7.2 Management	SC7.3 Resources	SC7.4 Organizational Architecture
SC7.1 Rules	–	3/8	2/5	3/4
SC7.2 Management	2 5/7	–	2 4/9	3
SC7.3 Resources	2 3/7	2/5	–	2
SC7.4 Organizational Architecture	1 1/3	1/3	1/2	–

Source: Own elaboration.

APPENDIX 4

Weighted priorities matrix for the elements of the leadership and direction node

	SC7.1 Rules	SC7.2 Management	SC7.3 Resources	SC7.4 Organizational Architecture	∑	Wloc	Wglo
SC7.1 Rules	0,1335	0,1742	0,0943	0,1112	0,5133	0,1283	**0,0206**
SC7.2 Management	0,3635	0,4742	0,5609	0,4461	1,8448	0,4612	**0,0741**
SC7.3 Resources	0,3246	0,1937	0,2291	0,2941	1,0416	0,2604	**0,0419**
SC7.4 Organizational Architecture	0,1783	0,1579	0,1157	0,1485	0,6004	0,1501	**0,0241**
Priority of Leadership and Direction Node						**1**	**0,1607**

Source: Own elaboration.

APPENDIX 5

Matrix of consensus of the judgments given by the group to the member's capabilities node

	SC8.1 Learning	SC8.2 Innovative	SC8.3 Financial	SC8.4 Technical
SC8.1 Learning	–	1	1 1/6	1 7/9
SC8.2 Innovative	1	–	2 1/2	1
SC8.3 Financial	6/7	2/5	–	2/3
SC8.4 Technical	4/7	1	1 3/7	–

Source: Own elaboration.

APPENDIX 6

Weighted priorities matrix for the elements of the Member's capabilities node

	SC8.1 Learning	SC8.2 Innovative	SC8.3 Financial	SC8.4 Technical	∑	Wloc	Wglo
SC8.1 Learning	0,2976	0,3054	0,1919	0,3980	1,193	0,298	**0,0285**
SC8.2 Innovative	0,2793	0,2866	0,4082	0,2202	1,194	0,299	**0,0285**
SC8.3 Financial	0,2549	0,1154	0,1644	0,1569	0,692	0,173	**0,0165**
SC8.4 Technical	0,1682	0,2927	0,2355	0,2249	0,921	0,230	**0,0220**
Priority of Member's Capabilities node						**1**	**0,0954**

Source: Own elaboration.