

Review

Socio-productive dynamics in agricultural systems. Conceptual theoretical bases for the study

Dinámicas socioproductivas en sistemas agrícolas. Bases teóricas conceptuales para su estudio

Dinâmica socioprodutiva em sistemas agrícola. Bases teóricas conceituais para o estudo



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Abstract

Agricultural production systems are very dynamic, the use and combination of production factors by the farmer is reflected in different levels of production and family well-being. The objective of this article was to build a theoretical - conceptual reflection, for a multiple, interdisciplinary and transdisciplinary approach in the interpretation of phenomena that are not caused exclusively by one factor. For this, a systematic bibliographic review of documents hosted on Google Scholar/Google was carried out, which allowed analyzing and comparing concepts and theories associated with the topic, highlighting Bertalanffy's systems theory, Morin's complexity and Lonergan's economic dynamics. In addition, concepts associated with the research such as productivity, agricultural systems, territory and family well-being were considered. The search found fifty-eight documents, which were subjected to filters for pre-established exclusions. As a result of these filters, eighteen were selected for analysis, which allowed the construction of a theoretical-conceptual argument for the study and analysis of socio-productive dynamics in agricultural systems, which focuses on how the inputs represented by the producer, capital, Information and agricultural inputs are related to each other and interact with other factors such as local technology, workforce, territory, environment and marketing and how these generate different levels of yield, productivity and welfare being in the system for the farmer and his family.

Resumen

Los sistemas de producción agrícolas son muy dinámicos, la utilización y combinación de los factores de producción por parte del agricultor se ve reflejada en distintos niveles de producción y bienestar familiar. El objetivo de este artículo fue construir una reflexión teórica - conceptual, para el abordaje múltiple, interdisciplinario y transdisciplinario en la interpretación de fenómenos que no son causados exclusivamente por un factor. Para esto, se realizó una revisión bibliográfica sistemática de documentos alojados en Google Académico/Google, que permitió analizar y comparar conceptos y teorías asociadas al tema, destacando la teoría de sistemas de Bertalanffy, de la complejidad de Morín y la dinámica económica de Lonergan; además se consideraron conceptos asociados a la investigación como productividad, sistemas agrícolas, territorio y bienestar familiar. La búsqueda arrojó cincuenta y ocho documentos, los cuales fueron sometidos a filtros para exclusiones preestablecidas. Como resultado de estos filtros, se seleccionaron dieciocho para analizarlos, lo cual permitió construir un cuerpo teórico-conceptual para el estudio y análisis de las dinámicas socioprodutivas en sistemas agrícolas, el cual se centra en cómo las entradas representadas por el productor, el capital, la información y los insumos agrícolas, se relacionan entre ellas e interactúan con otros factores como la tecnología local, fuerza laboral, territorio, ambiente y el mercadeo y como éstas generan en el sistema diferentes niveles de rendimiento, productividad y bienestar para el agricultor y su familia.

Palabras clave: bienestar familiar, territorio, agricultor.

Resumo

Os sistemas de produção agrícola são muito dinâmicos, a utilização e combinação de fatores de produção pelo agricultor reflete-se em diferentes níveis de produção e bem-estar familiar. O objetivo deste artigo foi construir uma reflexão teórico-conceitual, para uma abordagem múltipla, interdisciplinar e transdisciplinar na interpretação de fenômenos que não são causados exclusivamente por um fator. Para isso, foi realizada uma revisão bibliográfica sistemática de documentos hospedados no Google Acadêmico/Google, que permitiu analisar e comparar conceitos e teorias associadas ao tema, destacando a teoria dos sistemas de Bertalanffy, a complexidade de Morín e a dinâmica econômica de Lonergan. foram consideradas pesquisas como produtividade, sistemas agrícolas, território e bem-estar familiar. A busca rendeu cinquenta e oito documentos, que foram submetidos a filtros para exclusões pré-estabelecidas. Como resultado desses filtros, foram selecionados dezoito para análise, o que permitiu a construção de um corpo teórico-conceitual para o estudo e análise da dinâmica socioprodutiva nos sistemas agrícolas, que enfoca como os insumos representados pelo produtor, capital, A informação e os insumos agrícolas estão relacionados entre si e interação com outros fatores, tais como tecnologia local, força de trabalho, território, ambiente e marketing e como estes geram diferentes níveis de desempenho, produtividade e bem-estar no sistema para o agricultor e sua família.

Palavras-chave: bem-estar familiar, território, agricultor.

Introduction

The reality of agricultural production systems is complex, therefore, the combination and interrelation of factors create very specific social, economic, productive and environmental dynamics. In this sense, small farmers try to increase their level of production, however, not all of them have the capacity to do so, because it depends to a large extent on the way in which these factors and/or resources are combined, in addition to the influence of third parties in decision-making in the system.

The study of agricultural systems has been explained fundamentally from the analytical scientific paradigm (Casanova *et al.*, 2015), generating a highly productive and profitable agriculture, but with great environmental and social consequences (Sarandón, 2019), hence the trend in agricultural research considers a more complex approach that relates these dimensions, their dynamism and results.

Under this premise, the objective of this research is to establish a theoretical-conceptual reflection for the study of socio-productive dynamics, which allows a multidisciplinary and focused approach in the interpretation of such phenomena, in order to understand the different levels of production and family welfare.

Methods

During October 2023 to March 2024, a systematic literature review was developed around the research topic considering mainly system theory (Bertalanffy, 1976); complexity theory (Morin, 2018), agricultural systems (FAO, 2005), productivity (Samuelson, 2006) and family welfare (Bautista and Morales, 2016), as well as concepts related to system dynamics (Perazzi and Merli, 2022), economics (De Neeve, 2009) and social dynamics (González, 2011).

The research was conducted in two stages: the first corresponds to the search of bibliographies and selection of studies related to the topic published since 2000, and the second corresponds to the classification, analysis and integration of the content.

The inclusion criteria were books, theses and articles, excluding subdocuments and abstracts. The literature search considered primary sources such as scientific journals and tertiary sources such as textbooks (Vera, 2009), hosted in databases and archives of research and teaching centres or linked through Google Academic/Google, and then chose descriptors or keywords for the main concepts or theme of the research. The combination of keywords included: 'agricultural dynamics', 'agricultural economic dynamics', 'agricultural systems', 'family dynamics', 'agricultural productivity', 'agricultural system characteristics', 'socially productive' and 'rural family welfare'.

In accordance with the stated objective, 58 documents were selected and downloaded, which were mainly examined for their summary, objectives and results, and then classified according to their title, objectives and relevance to the different concepts associated with the study. Thus, 18 documents were selected for the analysis and integration of content, with the academic articles being the most representative, allowing us to conclude that the results of this review are mainly based on reflective and comprehensive processes.-

Discussion

Bertalanffy's (1976) systems theory has an important weight in the proposed referential, as it proposes that the system can be reproduced in different contexts, from the system of a company or productive unit, an industrial process or, in this case, the socio-productive dynamics. Within this system, interactions occur between the different components that change the behaviour or nature of elements and it is here where Morin's (2006) theory of complexity provides the basis for understanding the study. According to the author, these interrelations are conceived with two main characteristics: the first, the interrelation of economic, social and environmental elements and the second, the global unit constituted by these interacting elements.

Changes in the components or behaviours of agricultural systems bring about economic and technical results, hence the importance of Bernard Lonergan's theory of economic dynamics, cited by De Neeve (2009), as well as definitions and concepts related to agricultural systems, which are discussed below.

Dynamics. Acceptions

The study of dynamics related to agricultural sciences gives us the opportunity to explain and contribute to establishing a definition for the study of socio-productive dynamics in agricultural systems. In this sense, Aracil and Gordillo (1997) explain the theory proposed by Wright Forrester in terms of dynamics applied to systems, finding that it is a discipline that represents all types of complex systems, including applications within the system. In the social sciences, this theory provides a technique for designing simulation models of the complex systems that characterise agricultural systems.

The main aspect of these systems is the economic factors, so this topic has been widely studied mainly in the theory of economic dynamics. In this respect, De Neeve (2009) explains that these dynamics are related to growth and development through cycles that include connections between the basics and the aggregates of production. These relationships and cycles are largely determined by the formation of the family nucleus and the decision-making capacity of individuals.

In this sense, each individual interacts differently with other members of society, and from this social dynamics are born, whose purpose, according to Popescu (1962), is the study of the progress of social groups in society, that is, when studying the activities of human development over time, what is really wanted is to understand the social, economic, political, religious, ideological, artistic, and other dimensions.

In line with the above, the concept of dynamics proposed for the study of agricultural systems refers to the interactions that occur between the components and dimensions of the system, in which the individual and the family nucleus play a decisive role in the management of economic and natural factors that generate models of agricultural systems with their own characteristics; where women have managed to develop essential tasks in agroecosystems (Rosales and Leyva, 2019), providing labour, as well as carrying the responsibility for the children and food security in the home (Salcedo *et al.*, 2014). The family and the farm are linked, evolve together and combine economic, environmental, social and cultural functions (Graeb *et al.*, 2016).

Agricultural production systems. Dimensions for their study

Since the German biologist Ludwig Von Bertalanffy (1976) created the general systems theory, it has been widely used and adapted by many researchers. According to this theory, the agricultural enterprise functions as a system that develops production patterns that

correspond to the basic rules of interaction of the building blocks for successful operations. A systematic research approach allows, on the one hand, to understand the important events occurring in the process and, on the other hand, to formulate the most appropriate and repeatable alternatives that improve production and processing efficiency in these systems.

In order to understand and apply systems theory in agricultural production, it is necessary to consider the definition of production system FAO (2005) referring from the microeconomic context to production units in which there is a spatial and temporal combination of a defined labour force (families, wages, etc.) and various means of production (land, water and irrigation systems, animal and plant genetic resources, tools, etc.) for the production of products.

These combinations also interact with external factors such as policy, institutions, markets and information linkages that can significantly affect their functioning, as well as biological, physical, social, economic and technological factors (Hall *et al.*, 2001). These interactions affect different farming systems, which allows for the development of broad, thematic categories and the identification of flexible potential projects, recognising the heterogeneity of these categories. In this sense, Hall *et al.*, (2001), states that the factors that influence the interaction and determine the agricultural production system are: natural resources and climate, science and technology, trade and market development, and policies, institutions and public goods.

Agricultural productivity and family welfare

Productivity refers to the relationship between the quantity of output produced by a productive system and the resources (land, capital, labour, supplies) used to obtain that output (Samuelson, 2006). Basically, two of them are analysed: labour productivity, or productivity per hour of work, which is defined as an increase or decrease in yield as a function of the work required for the final product, and factor productivity (TFP), which defines the increase or decrease in profit when any factor related to production changes: labour, capital or technology, among others. High productivity implies that a lot of economic value can be produced with little labour or little capital. An increase in productivity implies that more can be produced with the same amount (Samuelson, 2006).

In agriculture, the measure of crop productivity per unit area is the most widely used (Villota *et al.*, 2020); knowing this indicator and describing the importance that farmers attribute to the factors of production is vital to be able to compare them with those of other farmers, educational and research organisations (Infante, 2016); so that the results can generate a model that promotes the productivity of the agricultural system and creates healthy living conditions for the well-being of the farmer, his family and his territory.

This well-being according to Nabarrete and Gijón (2018) considers food and clothing first, then health and education, followed by housing, the concept refers to the set of things that are needed to live well; it is given as a function of income, a higher income provides the individual with more resources to consume (Méndez and Reyes, 2016). Welfare is, therefore, the satisfaction of primary and material needs, which is achieved through higher income, conditions and the environment in which people live. In the agricultural sector, mainly in small production systems, farmers together with their direct family establish their own resource management mechanism, although agricultural work in many cases has become a secondary activity in rural territories (Albornoz and Maldonado, 2022); farmers are able to satisfy their needs for food, education and self-development in order to achieve a certain welfare or quality of life.

From complexity theory to the explanation of socio-productive dynamics

Complexity can be characterised by the concept of interaction, the structure of events, actions, feedbacks, regulations, contingencies that shape our phenomenal world and create an organisation. This is one of the defining features of Morin's (2018) works. Interaction includes elements, beings or material objects that encounter each other; they assume conditions of encounter; they follow definitions/tasks that depend on the nature of the elements, objects or beings encountered and that, under certain conditions, become mutual relations (associations, combinations, communication, among others), i.e., create organisational phenomena (Morin, 2006).

Therefore, for organisation to exist, there must be interactions, encounters, and for there to be encounters there must be disorder. Complexity is the union of simplification processes that require selection, hierarchisation, separation, reduction, against processes that require communication (Morin, 2018).

In relation to the above, in agricultural production systems, the relationships between systems and sub-systems are essentially exchange or transmission links that bind them together. These interactions have specific characteristics such as synergy, hierarchy, recursion, complementarity, competition, internal customer and critical points (Morin, 2018). An agricultural system can have multiple interactions, each with a greater weight than the others, depending on the priority of each system.

Under these premises the socio-family interaction; has an important weight in the socio-productive dynamics, so in horticultural production systems this interaction exerts an important aspect in its dynamics, mostly part of what Salcedo *et al.* (2014) call family farming, considering here all family farming activity related to various aspects of rural development, it is a way of organising agricultural and forestry production, as well as fishing, grazing and aquaculture, which is managed and controlled by the family and depends mainly on family labour, both women and men.

For these families, the production unit is not only a place of work, it is a space where children grow up, exposed to agricultural activities (Salcedo *et al.*, 2014), it is a permanent home where all family members live and grow, where grandparents play a key role in the continuity of the agricultural practices used and instil the love for agriculture in the grandchildren.

Similarly, the interaction between territory and environment is a determining factor in socio-productive dynamics, although the terms territory and environment were rarely considered, today multidisciplinary is essential. Territory is a biophysical space resulting from historical processes and actions conducted by actors on the social appropriation of spaces built around the use and exploitation of local resources and environmental components (Lee-Cortés *et al.*, 2018).

At the same time, political and social interaction plays an important role in socio-productive dynamics. Parsons (2007), argues that public policy issues are highly contextual and contingent; defined and shaped by particular historical circumstances and settings, so any 'solution' must take into account that contingency, which includes how public policy actors perceive, interpret and even manipulate problems.

Finally, the interaction between environment and production system can have a positive or negative effect on production systems, so it is necessary to consider the nature of the environmental conditions and factors surrounding the organization.

Socio-productive Dynamics. Model for its study

The concept of socio-productive dynamics arises from the above-mentioned references, referring to the interaction that takes place

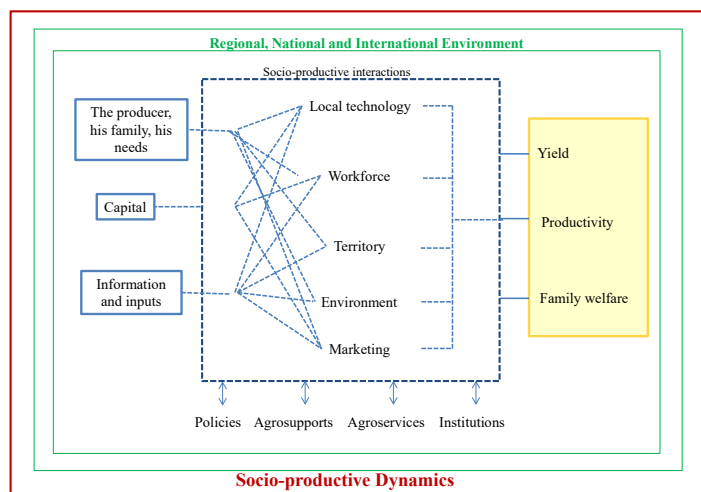
in the production system, which combines social, technical and economic factors, which are also related to the environment and the territory, and which produces well-being for the farmer and his family.

Similarly, socio-productive dynamics are adaptive and responsive strategies that are constantly born and formed in the activities of the farmer and his family according to the sequence of the means of production, land and labour.

One way to explain and identify socio-productive dynamics is through the systematic model (Figure 1) constructed from the theories and concepts outlined above; the components are illustrated as follows: -Inputs (information, capital, materials and human resources) coming from outside; -Conversion process (conversion of input energy into output energy) depending on the set objective and socio-productive interactions; -Output (what is obtained from the system through product or residue); -Feedback, shows how different the behaviour of the system is from the intended objectives, so that corrections can be made to achieve the objectives; -Environment, the macro system to which the target system belongs; and -Boundary, the exchange of the external environment with other sub-systems.

The proposed model shows the components, interactions and relationships in the agricultural production system as mutual actions that change the behaviour or nature of existing or affected elements, bodies, objects or phenomena (Morin, 2018).

Figure 1. Model of socio-productive dynamics in agricultural production systems.



The inputs to the system are composed of: (a) the farmer, his family and their needs, where the important thing is to identify who are responsible for the decisions around everything that happens in the system and what are the factors they consider most important for those decisions; (b) the financial resources available to the producer to carry out his activity, it seeks to identify the origin of the financial resources and quantify whether the system is able to generate the necessary resources to meet the needs of the family and the next production cycles and; c) information related to all the processes involved and their environment. The availability of communication is key to the development of productive activities, linked to the supply of raw materials and inputs that lead to the transformation of activities.

These inputs are related and interact with fixed factors-land, capital, labour-; variable factors-electricity, diesel, seeds, fertilizers-and other factors-technology, government support, knowledge-, which together influence and determine the value of production (Infante, 2016). Likewise, the interaction with the characteristics of the territory

and the environment are essential in the identification of these socio-productive dynamics, as each region has its own characteristics and customs; and in many cases they face tensions over land use and agricultural vocation, urban expansion is a threat that imposes or affects production units, limiting or increasing them (Albornoz and Maldonado, 2022). The system is further influenced by the economic environment at regional, national and even international level which has a direct impact on the dynamics of the production system, as well as the characteristics of the market, access conditions and the impact of agricultural policies such as prices and credit, which is identified in the agrosupports and agroservices to which farmers have access. In this sense, agricultural public policies include a series of governmental decisions that aim to solve the problems of the agricultural sector and rural society in the general interest, this interaction can be reflected in agricultural systems such as governmental support for agricultural roads, basic services and transport (Valencia *et al.*, 2020).

Consequently, the multiple interactions are reflected in yields and productivity levels, a farmer's aim to achieve higher productivity with the same resources or producing the same goods or services leads to better profitability of the enterprise (Samuelson, 2006). The outputs of the system generate different levels of yields, productivity, and value of production as a contribution to family income and family welfare. This welfare is not only associated with agricultural income, it is also given by government transfers or subsidies, this brings double benefit because families make their small savings thanks to the subsidies they receive (Nabarrete and Gijón, 2018), to meet the needs of the family, such as food, clothing, health, education, which improve the living conditions of the family, culture, perceptions, feelings, ways of leading life.

The proposed model makes it possible to identify which interactions describe the socio-productive dynamics of the system. It is possible that the model tries to explain the farmer-information and input interaction and local technology and that this may have an important weight in the dynamics, because, on the one hand, most farmers use empirical local technology with marked differences in the use of inputs, mainly concerning crop fertilization, and on the other hand, even when there are tools to be informed about products, pest management, prices and agricultural practices, farmers refuse to incorporate the use of information technologies and to be part of a digital network that allows the flow of information of interest to them in order to improve yields, productivity and family wellbeing; farmers refuse to incorporate the use of information technologies and become part of a digital network that would allow information of interest to them to flow in order to improve yields, productivity and family welfare.

Conclusions

The study of dynamics in agricultural systems continues to be complex; the capacity to react to the changes and adversities faced by agriculture calls us to be attentive to any interaction of factors that may determine a different behavior. It is important to constantly review the literature and carry out field studies to validate these proposals.

From the point of view of reference, systems theory continues to be, in spite of time, very useful in the agricultural sciences, and there are more and more studies focused on analyzing the relationship between the social and the productive, and this article is a contribution to this branch of science.

To speak of dynamics is to refer to interactions and interrelationships, and in agricultural production systems these are very diverse and constantly changing, hence, analyzing socioeconomic dynamics represents a great step towards understanding the economic and productive results of agricultural systems.

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