



# Theoretical and Conceptual Considerations for Analyzing Social Interfaces in Agroecosystems

Felipe Gallardo-López<sup>1</sup>, Ariadna Linares-Gabriel<sup>1</sup> and Mario Alejandro Hernández-Chontal<sup>2\*</sup>

<sup>1</sup> Postgrado en Agroecosistemas Tropicales, Colegio de Postgraduados, Campus Veracruz, Veracruz, Mexico, <sup>2</sup> Facultad de Ciencias Agrícolas, Universidad Veracruzana, Xalapa, Mexico

## OPEN ACCESS

### Edited by:

Franz-Theo Gottwald,  
Humboldt University of  
Berlin, Germany

### Reviewed by:

Karl Kunert,  
University of Pretoria, South Africa  
Emma Louise Burns,  
Australian National University, Australia

### \*Correspondence:

Mario Alejandro Hernández-Chontal  
mariohernandez03@uv.mx

### Specialty section:

This article was submitted to  
Agroecology and Ecosystem Services,  
a section of the journal  
Frontiers in Sustainable Food Systems

**Received:** 25 January 2021

**Accepted:** 30 April 2021

**Published:** 28 May 2021

### Citation:

Gallardo-López F, Linares-Gabriel A  
and Hernández-Chontal MA (2021)  
Theoretical and Conceptual  
Considerations for Analyzing Social  
Interfaces in Agroecosystems.  
*Front. Sustain. Food Syst.* 5:658438.  
doi: 10.3389/fsufs.2021.658438

The current framework of agroecosystem (AES) knowledge focuses on a systemic approach or static structures rather than on dynamic processes that are defined historically. The hypothesis is that agroecosystems are the product of the interdependence of a diversity of actors (present and absent) and, therefore, constitute complex social interfaces, which, in order to address them, require a new understanding of the centrality of the actors and their capacity for agency. Then, regarding this complexity, some aspects are not clearly defined in the systemic approach which need to be more explicit such as: (a) the implicit psychosocial aspects and (b) the relationships with their social environment, how these affect them and are affected by them. The purpose of this document is to suggest a theoretical and conceptual approach to correct these unclear areas. First, the centrality of actors (including their agency capacity) in the AES is recognized. Besides, their interdependence with the diversity of actors (present and absent) and therefore the need to analyze the AES complex social interfaces.

**Keywords:** agroecosystems, agroecology, actor-oriented approach, social interface, agency

## INTRODUCTION

Agriculture is a key development, mainly for food production, for its origin and its effects on the population and society (Sarker, 2017). It is a complex activity that involves (1) the production of food and fiber (based on technological factors, natural resource endowments and capital impulses), (2) processes linked to the effects it produces on societies and ecosystems (Sicard, 2009). According to Gallardo-López et al. (2018), this refers to a complex society-nature relationship. As social actors become relevant, the challenge is to generate new ways of seeing and researching agriculture to consider disciplinary interfaces (Gallardo-López et al., 2019).

This complexity is accentuated in the modern age because farmers are operating in an increasingly complex and rapidly changing environment. They must balance conflicting demands involving social, political, economic, technological and environmental aspects (Hendrickson et al., 2008). Thus, this involves the traditional agrarian mode (peasant) and the agro-industrial mode (conventional) as two ways of conceiving, managing and using agroecosystems (Martínez, 2004). Furthermore, it implicates aspects related to increasing food productivity, resilience to climate change and reducing carbon emissions. In agroecosystems, unequal power relations, inequality and social injustice must also be taken into account and included in the policy and practice of agriculture (Chandra, 2017).

In fact, it is important to consider that an agroecosystem is both ecologically and socially important and that a genuinely transformative change in our food and agricultural systems is based on social and political change. Agroecology is here, the action-oriented approach to participate in this process (Gliessman and Ferguson, 2021). This involves several transitions at the social, biological, economic, cultural, institutional and political levels (Tittone, 2019; Tittone et al., 2020). It should be noted that agroecological science was originally developed by applying ecological principles to agricultural systems and then, by integrating social and political aspects that affect production in agriculture (Mason et al., 2020). Today, agroecology provides a path toward a new agriculture, one which goes beyond the routine of pesticides, enriches the matrix of nature and revitalizes and creates alternative systems of production (Altieri and Nicholls, 2020). According to these authors, it is evident that current and future agroecosystems have multiple challenges and the vision and transformative action needed to achieve such challenges lies in social change.

However, after analyzing the origin and evolution of agroecological science and its unit of study, agroecosystems, social aspects are later incorporated and still addressed as non-dynamic and ahistorical structures –as will be explained in the next section. In addition, contemporary research in AES focuses on increasing agricultural productivity disregarding the relevance of social aspects (Gallardo-López et al., 2020). Principally the psychosocial aspects implicit in agro-ecosystems (AES), their approach, as well as the relationship with the environment which affect and are affected, are not clearly defined. Therefore, this theoretical and conceptual proposal is suggested to address these unclear areas. The central hypothesis is that agroecosystems are the product of the interdependence of a diversity of actors (present and absent) and therefore constitute complex social interfaces, which require a new understanding of the centrality of the actors and their capacity for agency. Therefore, this document aims to provide some preliminary theoretical and conceptual considerations to address social interfaces in agroecosystems. Initially, the implications on the evolution of the agroecosystems concept are discussed. The centrality of actors is analyzed from an actor-oriented approach followed by the concepts of agency and social interfaces. Finally, the psychosocial and relational processes are understood in the context of the complexity of the AES.

## IMPLICATIONS FOR THE EVOLUTION OF THE AGROECOSYSTEM CONCEPT

Although this work is not intended to provide a historical overview of the concept of agroecosystems (AES), it is important to review the approaches used to show the implications, scope and limitations of such evolution. Initially, agroecosystem concepts considered the components and functions of natural ecosystems, including local knowledge and production strategies based on ecological principles (ecological pest management, crop association and agroforestry systems) (Altieri, 1999; Gliessman, 2011). Then, it was framed in the systems approach and its main

contribution was the application of the concept of hierarchies allowing the identification of different levels of agroecosystems (plant, crop, farm, region and larger scales) until transferring to a broader vision systems including ecological, economic and political aspects which recognizes the leading role that farmers that (Gallardo-López et al., 2018).

The concept of agro-ecosystems evolved along with systems thinking to complex systems thinking as described by Casanova et al. (2016). The authors mention that complex systemic thinking provides radical approaches to understand contemporary agricultural problems, but they have been ignored due to the scarce theoretical reflexivity, and the predominance of an analytical and empirical approach. Systems thinking has developed integrated analyses that favor the study of the components of the AES but not their interdependencies, hence it prevents them from being understood as a whole. In this sense, although even from the systemic conception, Gallardo López (2002) considered that the agroecosystem is a system which is a product of the relationship between human and nature in which structure there is a socioeconomic component (the producer and his family) and another productive component (the farm).

Other concepts explicitly consider the complexity of the agroecosystem. In this regard, Sarandón (2014) mentions that agroecosystems are complex systems with biological components that have been distributed in time and space, interacting with socio-cultural components (objectives, rationalities, knowledge and farmers' culture). The complexity is determined by their components and the interrelationships between them within a management framework in which the human being is intimately inserted in a socio-cultural context that determines the way one makes his decisions. In line with this, Cruz-Bautista et al. (2019) conceptualize the agroecosystem as an abstraction or a cut-out of the agricultural reality, which is managed by a controller who makes the decisions concerning its structure and functioning.

From its practical notion, the agroecosystem is situated in an analysis toward the redesign of agro-ecosystems that work on the basis of a set of ecological principles. These comprise interaction, complementarity, and relationship in systems that provide the capacity to resist the problems that industrial agriculture controls with an impressive variety of inputs and practices (Gliessman, 2012). These principles are based on physical and biological aspects considered from the initial conceptions. From this perspective, Josol and Montefrío (2013) consider agro-ecosystems from the concept of resilience to analyze their response to external changes. Moreover, the authors claim that exposure to low-level disturbances promotes heterogeneity in the landscape and promotes renewal and reorganization within the system. It is important to emphasize that the most recognized and accepted literature uses the agroecosystem as a scale of analysis in agroecology (Gallardo-López et al., 2018) and that the conjunction of the agroecosystem and agroecological practices is called a mixed conception (Fernández González et al., 2020). The authors indicate that in this mixed conception, there is no unanimous understanding of transdisciplinary approaches and few studies investigate their implementation. Mason et al. (2020) propose analyzing the social and political problems affecting production agriculture and incorporating knowledge

from various sources. However, they refer to the agroecosystems as studies conducted in the tropics with a focus on crop production and biodiversity.

There are also reflections on the analysis of agroecosystems with emphasis on autopoietic social systems. From this theoretical-conceptual perspective, the agroecosystem is a conceptual model that represents the agricultural reality, whose psychic system (producer) is the recipient of the autopoiesis of the agricultural system. Autopoiesis which is fed by the information that is communicated to it through the mass media (radio, TV, written press, internet), symbolically generalized media (money) and by the interaction systems (conversations held between two or more producers, producers and technicians, producers and institutional representatives, etc.). Such interactions provide them with new and valuable information that is used as a reference in decisions regarding the management of their agroecosystems (Casanova et al., 2016). It is also a model that represents the effects of autopoiesis, that of “subsistence, transitional and commercial production” systems. An approach that makes it possible to understand why a series of management practices are used by producers to modify ecosystems located in different geographic spaces for the purpose of producing food and raw materials (Casanova-Pérez et al., 2015).

While these abstractions recognize the farmer as a psychic system, in practice they place him as a passive subject who receives external information to be able to manage decisions in the agroecosystem. For this reason, it is needed to show a broader notion of people’s behavior, mainly as active subjects with the capacity to construct their own reality, in line with what has been called in development sociology as the “Actor-Oriented Approach” (Long, 2001). Thus, it is necessary to first understand why they do what they do (Cittadini and Pérez, 1996).

Therefore, to identify and solve problems of the object of study of agroecology (nature-society relationship) such as agroecosystems, a greater dialogue between the abstract and the empirical is suggested. It is still pending the understanding of agriculture from different perspectives oriented to the use of paradigms in which the social actors, their development and the impacts of their social tasks are considered the main axis of the study (Gallardo-López et al., 2018). The lessons learned from this analysis concern this look toward complexity with the purpose of responding to the problems of the current and future agricultural reality through the concept of AES. It should not only be framed in the productive process, it must involve environmental, economic, social and political processes and certainly, the cultural context. A theoretical and conceptual evolution of the concept of AES is evident, which is supported by the contributions of the various authors cited in this section. However, this evolution is centered on a systemic approach or static structures and not on dynamic processes that are defined historically. In this current framework of agroecosystem knowledge, the assumption that agroecosystems are the product of the interdependence of a diversity of actors (present and absent) and therefore constitute complex social interfaces becomes relevant, and that in order to address them it is necessary to recognize the centrality of the actors and their

capacity for agency. Therefore, within the approaches from the perspective of complexity, there are still aspects that need to be made explicit, mainly related to the implicit psychosocial aspects and the relationships with their social environment that affect and are affected.

## THE CENTRALITY OF THE ACTORS IN THE AGROECOSYSTEM

As it was mentioned above, these psychosocial processes need to be focused on the actors. In order to do this, it is important to clarify the notion of actors and to recognize that farmers, and the actors with whom they interact, are social actors with agency – this is further explained –. The main purposes of actor-oriented methodologies are to clarify how actors attempt to create space for their own “projects” and to determine what elements contribute to or impede the successful creation of such room for maneuver (Leeuwis et al., 1990). The actor-centered approach developed by Long (2007) is used to explore how social actors, whether local or external, engage in intertwined battles for resources, meanings, control and institutional legitimacy in particular arenas. It implies a vision of social construction of change and continuity in which a society through actions and perceptions transforms a world of diverse and intertwined actors. It is characterized by being more dynamic –a counterpoint to structural analysis– since it helps to understand social change, it emphasizes the interaction and determination of internal-external factors and relationships, and recognizes the central role played by human action and consciousness (Long, 1990).

Social actors are all those social entities that can be said to have agency, in the sense of the capacity to know and assess problematic situations and to organize “appropriate” responses. These entities can take a variety of forms: individual subjects, informal groups or interpersonal networks, organizations, groupings, and what sometimes are described as macro actors (e.g., the government of a particular nation, a church, or an international organization) (Long, 2015a, p. 77–96). By emphasizing the voices and experiences of individual actors and their own knowledge of development and modernity, one can focus on the local, everyday practicalities of making a living and how people defend them (Turner, 2012).

A variety of social actors interact within the AES. Some are local, such as the farmers themselves, local authorities, associations and organizations. External actors, some acting locally, such as technicians, buyers, distributors, policy implementers, and other external acting in broader spheres, such as international organizations, the state, programs and projects designed in the governmental spheres. Although there may be other actors, this only shows an example of how a diversity of actors intervene in agroecosystems, all of them with the capacity for agency. If we talk about actors, we recognize the AES can be referred to as psychosocial processes from an actor-centered perspective. Therefore, this perspective requires a detailed ethnographic understanding of everyday life and the processes by which images, identities and social practices are shared, discussed, negotiated and sometimes rejected by the

various actors involved (Long and Liu, 2009). Thus, focusing on the actor makes it possible to analyze the way in which different social forms develop, in the same or similar structural circumstances, that affect the way actors try to face or cope with certain situations (Roldán-Rueda, 2020).

This perspective supports the development of an empirical approach to psychosocial aspects in agroecosystems, taking into consideration the concept of human agency as a core part of this actor-centered perspective. In this way, it is proposed that AES are the product of a set of intertwined agencies; being conceived as a set of social, cultural and material elements, centered on the actor and rescuing the lived experience of the actors (Long, 2007). An important methodological guideline of the actor-oriented approach is to identify relevant actors without starting from preconceived notions of uniform actor categories or classes. Then, following this approach, the situated social practices of the actors are ethnographically documented including the way in which social relations, technologies and other resources (such as discourses and texts) are deployed (Hebinck et al., 2001).

Thus, if we take into account the technologies and material resources that are explicit and tangible in the agroecosystem, it is necessary to return to the notion of Actants. Long (2015b) in his work "*Activities, Actants and Actors: Theoretical Perspectives on Development Practice and Practitioners*" mentions that only actors are able to put actants into circulation. The precursor of "actants" was Latour (1996) who defined a symmetry of human and non-human components, showing how technologies, discourses (verbal and non-verbal) and other texts, material resources, symbolic elements, government policies, and human and non-human ways of life enter the development scene. In short, actants encompasses human actants (individuals and groups) and non-human actants (things, machines and other organisms) (Larrión, 2019). Therefore, discussing agency will not only include the actors present in the agroecosystems but also explicit tangible aspects such as seeds, fertilizers, machinery, irrigation systems, credit and development programs, to mention a few.

## PSYCHOSOCIAL APPROACH IN AGROECOSYSTEMS

For the psychosocial approach in AES the essential element is the concept of agency as mentioned above. According to Long (2007), the notion of human agency is based on an anthropological and historical vision and the contribution of micro-sociology that touches the sphere of everyday life and it considers the influence exerted in this sphere by actions at the macro-social level. Long takes up the concept of human agency from the structuration theory of Giddens (2011), for the latter author, agency is the capacity of individuals to act independently and make their own choices freely.

In Norman Long's actor-centered approach, agency refers to the knowledge capacity, capability and social integration associated with acts of doing (and reflecting) that impact on or shape oneself and the actions and interpretations of others. Individuals or networks of individuals have agency and they can

attribute agency to different objects and ideas which shape what actors see as possible. Agency is composed of a complex set of articulated social, cultural and material elements (Long, 2015a). In the attribution of agency to objects and ideas and the presence of material elements, the idea of actants explained in the previous section is taken up again. Long indicates that only actors are capable of putting actants into circulation. In this sense, agency implies the generation and use or manipulation of networks of social relations and the channeling of specific elements (such as demands, orders, goods, instruments and information) through nodal points of interpretation and interaction (Long, 2007).

It is also characterized by highlighting the main role of the individual as a social actor with the capacity to understand, interpret and question the macro-structures and dominant trends of Western development models –characterized by being exclusionary, authoritarian and, in general, designed in the bureaucratic spheres of the state, national and dominant elite –(Romero et al., 2012). Agency implies that social actors act according to their own interpretations of the situation and thus, assert their own normative values and goals, often through strategic actions (Landini et al., 2014a).

Recognizing that social actors have agency, social processes within AES are constituted by a series of psychosocial elements resulting from the relationships between the diversity of actors involved. This evidences local actors as active participants in development (not passive subjects). Agency helps to understand that the ways of doing and acting of local actors are based on their knowledge capacity (Long and Long, 1992). In other words, they make decisions according to their value preferences and the accumulation of available knowledge, resources and relationships. The farmer is seen as an active strategist who problematizes situations, processes information and gathers the necessary elements to act (Long, 2007). This main role shows how while interventions seek to assimilate their interests and practices, actors block, appropriate and assimilate them and in turn are mediated and transformed (Ye et al., 2009).

The intention of this work is to analyze psychosocial processes and this requires the inclusion of a psychological approach. This bridge between the social and psychological suggests an enriching and current approach to the recognition of social processes, material determinations, knowledge and technologies, all of which play a fundamental role in the context of rural development (Landini et al., 2014b). If agency goes beyond the local sphere, the complexity in these processes is recognized. Since the capacity for agency makes individuals try to solve problems and learn how to intervene in the flow of social events around them, they formulate and actively pursue their own development projects. Their plans may sometimes conflict with the interests of the people developing the external interventions or projects (Cieza and Vega, 2020).

An example that facilitates the understanding of agency is about the actors involved in the conservation of creole seeds. They have a list of factors that guide their choices and positions, which go beyond merely productive or external influences, and counteract the idea that socio-technical impositions reach all farmers homogeneously. Many farmers have biodiverse systems, i.e., agroecosystems in which the combination of



social and organizational systems with productive systems of different species and varieties are important strategies to satisfy the different uses and needs of the families (Campos and Soglio, 2020).

This complexity in terms of a more or less rigid organization of elements and processes (both human and non-human) it is articulated at different levels and observable from different angles or scientific disciplines. It shows that these elements, processes or levels may be salient or more decisive in different situations or in regard to particular analyses, objectives or interests (Landini et al., 2014b). Considering that the AES are located in defined rural territories, it is useful to distinguish between these two types of contexts. The first is the spatial context which refers to extra-local or general (national or international) processes that have a discernible impact on the local processes under study, both at the psychosocial and non-psychosocial levels. The second is the non-psychosocial context which refers to non-psychosocial, local and extralocal factors (such as the economy, political structure and types of land tenure and agricultural technology) that have a psychosocial impact on our area of study. Therefore, this proposal places AES in the model of Agency and psychosocial processes in the context of the complexity proposed by Landini et al. (2014b) (**Figure 1**).

It is recognized that psychosocial processes are articulated with socio-political, economic, biophysical realities or levels of analysis and how they can be integrated or combined with the concepts of agency and strategies as indicated by Landini et al. (2014b). In this regard, the agroecosystem is situated as part of the complexity that encompasses the biophysical reality and the psychosocial processes where the local actors are situated. It is acknowledged that the agroecosystem is not restricted to this alone, but that the economic and socio-political levels of analysis cause a dynamic among the actors involved and that each exerts some degree of agency (**Figure 1**). They can include technological elements such as seeds, fertilizers, machinery, irrigation systems or symbolic elements implicit in credit and development programs, among others. Thus, it is important to understand the psychosocial processes in the agroecosystem in terms of social interfaces of multiple actors and non-human actors, which will allow for processes and power relations in the dynamics of interaction.

## SOCIAL INTERFACES IN AGROECOSYSTEMS

There are interactions of a range of different actors, not only between the actors present in certain face-to-face encounters, but also among those absent who nevertheless influence the situation and thus affect actions and outcomes (Long, 2007). In this regard, Long points out that the *social interface* constitutes a node that makes it possible to analyze situations in an integrated manner in their heterogeneity and dynamism and to compare phenomena that are often thought of independently. It is a way to organize the study in a procedural sense to finally have a dynamic vision of all the social actors.

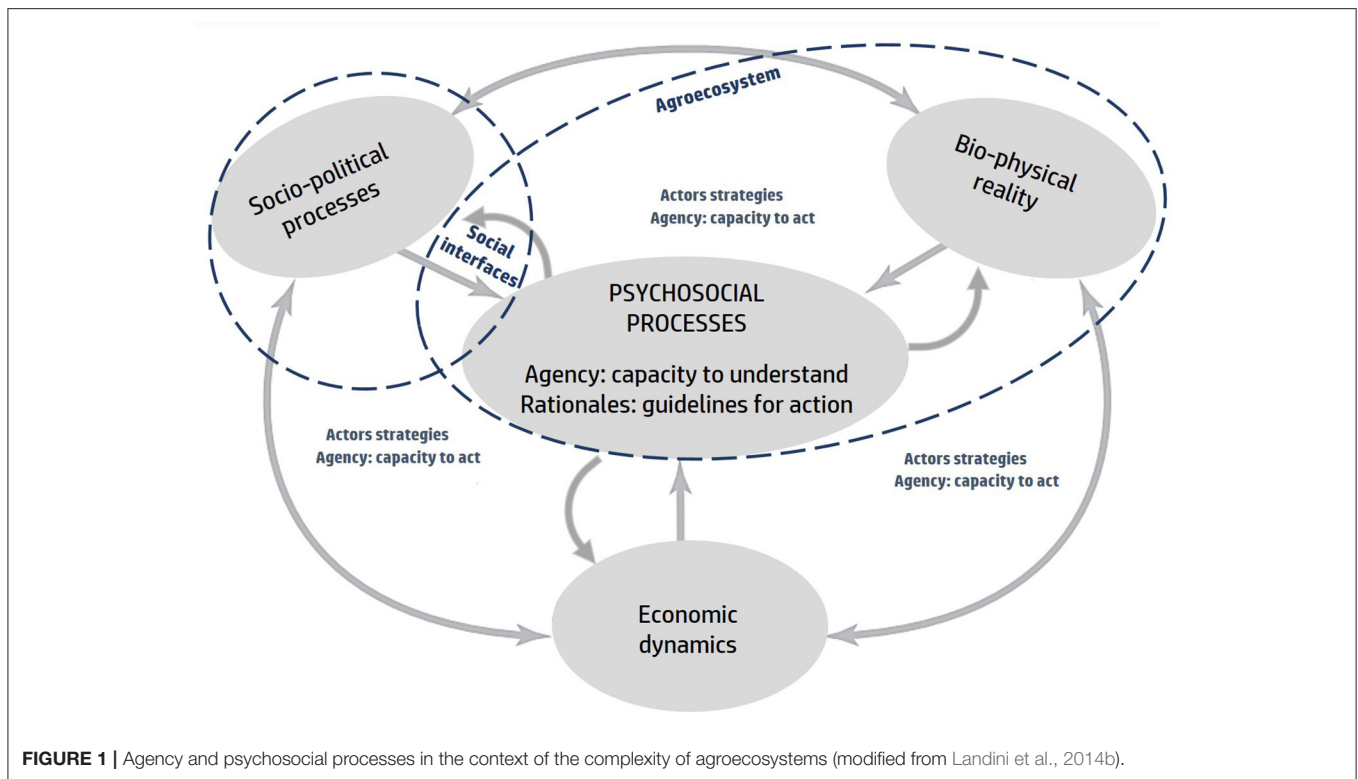
Therefore, this proposal considers that agroecosystems are the product of the interdependence of a diversity of actors; therefore, they constitute complex social interfaces. The social interface is conceptualized as... “a critical point of intersection between different lifeworlds, social fields or levels of social organization where social discontinuities, based on discrepancies in values, interests, knowledge and power, are most likely to be located” (Long, 2007).

It also considers areas of knowledge and interaction that intertwine the perspectives of a great diversity of actors (state, non-governmental, the beneficiary population, providers of credit, technologies, machinery, tools and inputs). In other words, a field socially constructed on the basis of conflict and negotiation, in which the distribution of resources and the legitimization of the intervention processes of the different actors are defined (Feito, 2007). Pertaining to the above mentioned notion, social interfaces not only refers to whether perspectives, experiences and worldviews differ among the actors involved, but also how these encounters are shaped by unequal power relations, a now common approach in development cooperation (Gerharz, 2018).

Thus, the social interface is a conflictive space in which different frameworks of meaning are articulated and allows addressing the complex processes of appropriation, translation and reconfiguration of knowledge and recommendations that occur in this connection. It is relevant to consider that knowledge is a cognitive and social construction resulting from the experiences, encounters and discontinuities that arise at the points of intersection between the lifeworlds of different actors (interface). Then, the importance of interface analysis is to highlight the knowledge and power implications in this interaction and the mixing or segregation of opposing discourses (Landini et al., 2014b).

“The concept of interface, is not simply there to represent the ability of ‘structures’ to functionally reproduce themselves or accommodate increasing incompatibilities, but to identify the potential of different actors to innovate and thus create the conditions for people and resources to realign themselves in different combinations” (Long, 2015b). Interfaces are characterized by discontinuities in interests, values, power and their dynamics involving negotiation, accommodation and the struggle for definitions and boundaries (Long and Villarreal, 1993). According to the authors, a detailed study of interfaces provides important information on the processes by which: (a) policy is transformed, (b) how forms of power are generated, (c) how room for maneuver is created by both interveners and their beneficiaries, and (d) people are enmeshed within the projects of others through the use of development metaphors and images.

Social interfaces, however, extend beyond the rationalities of smallholder farmers to include the priorities and perspectives of various relevant development actors. Thus, they examine what happens when actors play different roles, have different identities, and exercise power in different ways (Tobin and Glenna, 2019). If the elements of the actor-centered perspective theory, agency and social interfaces are considered to understand the complexity of agroecosystems, it is necessary to deconstruct the elements located within the systemic approach in which the evolution of



the AES concept is framed. If these processes are recognized as dynamic, we must focus on the practices and daily life of the actors.

According to Long (2007), social actors should not appear as mere disembodied social categories (based on class or some other classificatory criterion) or passive recipients of interventions. Rather, they should be seen as active participants who receive and interpret information and design strategies in their relations with the various local actors, as well as with external institutions and their staff. These approaches are contrary to what has been worked on with respect to agroecosystems and the implications of the evolution of the concept in this work.

Mainly when considering farmers as passive subjects that receive external information to be able to make management decisions in their agroecosystem or considering them as categories to organize their social life (e.g., producers categorized as self-consumption, transition and commercial strata). Now, if we visualize in practice how the concepts of agency and social interface are articulated in the AES, we have that agency shows the actors' strategies and discursive encounters. Moreover, due to the actants, actors put into circulation, as mentioned above, interfaces which implies encounters between actors and between technologies and material resources.

Certainly, in agroecosystems, the social interface is an opportunity to no longer look only at static structural elements but at changes, adjustments and readjustments, which in practice means that in the AES:

- 1) Diverse local and external actors (not only farmers) interact, with agency capacity.
- 2) Social actors are active participants. They are not passive subjects in agroecosystems and development processes.
- 3) Social actors sometimes share common objectives but in many cases they are opposed to each other.
- 4) Interaction between actors are not simple relationships, they involve complex social interfaces, where different frameworks of meaning are articulated and complex processes of appropriation, translation and reconfiguration of knowledge can be understood.
- 5) They are constituted by complex social processes of interaction of a multiplicity of actors, so understanding farmers' practices requires a broader vision that considers macro-structures that impose agency at the local level, and e.g., the market, the state, planned development interventions.
- 6) Making the psychosocial elements visible helps to understand the relationships of the actors with their environment that affect and are affected by them.
- 7) Farmers' management decisions have to do not only with monetary values or production purposes, but also with implicit psychosocial elements that determine "why they do what they do."
- 8) The central elements in their social interfaces involve understanding the values, interests, knowledge and power of the actors involved.
- 9) It is relevant to consider the learning processes within the link between actors: farmers with technicians, policy designers and implementers, researchers, development agencies and a diversity of other actors.

- 10) Agricultural technologies, material resources and symbolic aspects implicit in development programs, credit -to mention a few- are actants that the actors put into circulation and form part of a set of interwoven agencies. These actants are transmitted by the actors and they are part of a set of intertwined agencies.

From these elements emerges the question: How can we visualize these elements within the AES? Methodologically, the following should be analyzed: farmers' practices, their encounters with technicians and extensionists, and the transactions (not only monetary) they carry out with marketers and collectors of their products. Besides, how they interact with the implementers of programs and projects planned by the State, organizations and institutions. At the same time, how the decisions of the State and the market exert political agency which is inserted in the daily life of local actors. All this represents, to a greater or lesser extent, the complexity of agroecosystems. Moreover, it should be emphasized that from this perspective, detailed ethnographic work is required to understand all these processes.

The ethnographic work "*aims to elucidate internally generated strategies and processes of change, the links between the small worlds of local actors and global phenomena and large-scale actors, and the decisive role played by diverse and often contradictory forms of human action and social consciousness in the making of development*" (Long, 2007). Ethnography, then, is a strategic process in which the researcher acts connecting experience and knowledge about the method with creativity and personal commitment. It is also a multitechnical strategy that achieves scientific rigor as it allows the emergence of the principles of creativity, systematicity, transparency and empirical reference (Nawrath, 2010). In consequence, we achieve a configuration of cultural contexts that takes into account the subjectivity, change and multilocal dynamics they hold and places us in a perspective that takes into account both the subjective and the social practices of the communities we investigate (Puentes, 2015).

## DISCUSSION

From the actor-oriented approach, the social aspects of agroecosystems are not limited to farmers alone. But to a whole diversity of present and absent actors that operate in the social, cultural, political, economic, technological and environmental spheres. In addition, a series of aspects of social disorder rather than order are unraveled, showing the contradictions in social processes, as opposed to being interpreted as apathy in accordance with the dominant vision of progress that pretends to show a series of positive aspects and hegemonic character.

It is important to highlight that the predominant approach is oriented toward a problematic vision that evidences that the conception of agroecosystems is based on modern western rationality, centered on agriculture as a paradigmatic, manipulable and factory construct that considers the subject as an instrument that can create and manage it (Lugo Perea and Rodríguez Rodríguez, 2020), in other words, a Modern technical-scientific rationality that triggered the ecological and environmental crisis that encouraged its emergence

(Sarandón, 2019). Even with these limitations, agroecological research and its object of study, agroecosystems, have now incorporated the social, economic, cultural and political factors that guide the path of the pluriepistemological character that is not very visible in the epistemological status of agroecology (Gallardo-López et al., 2019).

The challenge is still great, if we consider sustaining these visions from praxis. It seems that the guideline is to move toward the use of paradigms where the social actors, their development and the impacts of their social tasks in agriculture are considered the main axis (Gallardo-López et al., 2018). However, there are some important successes that consider agriculture as a social system that not only considers farmers, but also other actors that are related to them (Duru et al., 2015), the methodological scopes proposed by these authors focus on agricultural systems based on place and space, on the interactions between actors and on innovation processes that must be designed in a top-down manner. In this sense, we do not entirely agree, especially in the last aspect, since what we propose focuses on the actors and their capacity for agency, on relationships rather than interactions and on bottom-up processes that give protagonism to the actors in the local sphere. We clarify that we differentiate relationships from interactions because we recognize that agency requires the generation of relationships and guiding elements such as demands, goods, instruments and information through nodal points of interaction (Long and Villarreal, 1993). In this sense, the ten points we propose to address the social interfaces in agroecosystems are an opportunity that contributes to a new vision of agroecosystems from theory and practice.

## CONCLUSIONS

This work shows that agroecosystems are the product of the interdependence of a diversity of actors (present and absent) and, therefore, constitute complex social interfaces, which require a new understanding of the centrality of the actors and their capacity for agency. The perspective centered on the actor, agency and the social interface was proposed as theoretical and conceptual tools to contribute to the understanding of these dynamic processes. They are principally related to psychosocial and relational processes in the context of the complexity of agroecosystems. Some initial considerations emerged from the analysis to visualize social interfaces in agroecosystems as well as some methodological guidelines which suggest a different approach to current approaches in the study of agroecosystems.

## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## AUTHOR CONTRIBUTIONS

FG-L, AL-G, and MH-C contributed to the design, analysis and writing of this manuscript. All authors contributed to the article and approved the submitted version.

## REFERENCES

- Altieri, M. (1999). *Agroecología: Bases Científicas Para una Agricultura Sustentable*. Editorial Nordan-Comunidad. Available online at: <http://www.fao.org/agroecology/database/detail/es/c/893011/>
- Altieri, M. A., and Nicholls, C. I. (2020). Agroecology and the reconstruction of a post-COVID-19 agriculture. *J. Peasant Stud.* 47, 881–898. doi: 10.1080/03066150.2020.1782891
- Campos, M. L. D., and Soglio, F. K. D. (2020). Creole seeds and power relations in agriculture: interfaces between biopower and social agency. *Amb. Soc.* 23:e02422. doi: 10.1590/1809-4422asoc20180242r2vu202015ao
- Casanova, L., Martínez, J., López, S., and López, G. (2016). De von Bertalanffy a Luhmann: deconstrucción del concepto “agroecosistema” a través de las generaciones sistémicas. *Rev. Mad* 35, 60–74. doi: 10.5354/0718-0527.2016.42797
- Casanova-Pérez, L., Martínez-Dávila, J. P., López-Ortiz, S., Landeros-Sánchez, C., López-Romero, G., and Peña-Olvera, B. (2015). El agroecosistema comprendido desde la teoría de sistemas sociales autopoieticos. *Rev. Mex. Cien. Agríc.* 6, 855–865. doi: 10.29312/remexca.v6i4.625
- Chandra, A. (2017). The relevance of political ecology perspectives for smallholder climate-smart agriculture. *J. Political Ecol.* 24, 821–842. doi: 10.2458/v24i1.20969
- Cieza, R. I., and Vega, M. (2020). El programa cambio rural en el periurbano platense: un estudio desde la perspectiva de los actores (2009–2017). *Estudios Rural.* 10, 1–18. Available online at: <http://portal.amelica.org/ameli/jatsRepo/181/181929033/index.html>
- Cittadini, R. A., and Pérez, R. (1996). La importancia de comenzar entendiendo por que el productor hace lo que hace. el caso de maíz para forraje. *Vis. Rural* 5, 36–39.
- Cruz-Bautista, P., Casanova-Pérez, L., Martínez-Dávila, J. P., Flores-Martínez, C., and Villegas-Rodríguez, I. (2019). Family as a social system and homegarden agroecosystem: conceptual theoretical model from the Luhmannian theory [agriculture; Luhmann; first order observer; second order observer; social-environmental phenomena.]. *Trop. Subtrop. Agroecosyst.* 22, 713–722. Available online at: <http://www.revista.cba.uady.mx/urn:ISSN:1870-0462-tsaes.v22i3.2906>
- Duru, M., Therond, O., and Fares, M., h. (2015). Designing agroecological transitions; a review. *Agron. Sustain. Dev.* 35, 1237–1257. doi: 10.1007/s13593-015-0318-x
- Feito, M. C. (2007). Modalidades de intervencion social sobre los horticultores bonaerenses: una mirada antropológica. *Avá* 19, 78–96. Available online at: <http://ref.scielo.org/b6nwmr>
- Fernández González, C., Ollivier, G., and Bellon, S. (2020). Transdisciplinarity in agroecology: practices and perspectives in Europe. *Agroecol. Sustain. Food Syst.* 45, 523–550. doi: 10.1080/21683565.2020.1842285
- Gallardo López, F. *Los agroecosistemas de la Subprovincia Llanura Costera Veracruzana: Una propuesta para la caracterización y el análisis tipológico de la agricultura regional Campus Veracruz*. Veracruz: Colegio de Postgraduados (2002).
- Gallardo-López, F., Hernández-Chontal, M. A., Cisneros-Saguilán, P., and Linares-Gabriel, A. (2018). Development of the concept of agroecology in europe: a review. *Sustainability* 10:1210. doi: 10.3390/su10041210
- Gallardo-López, F., Hernández-Chontal, M. A., Linares-Gabriel, A., and Cisneros-Saguilán, P. (2019). Scientific contributions of agroecology in Latin America and the Caribbean: a review. *Rev. Facul. Cien. Agr.* 51, 215–229. Available online at: <https://revistas.uncu.edu.ar/ojs3/index.php/RFCA/article/view/2447>
- Gallardo-López, F., Hernández-Chontal, M. A., Linares-Gabriel, A., and Cisneros-Saguilán, P. (2020). The postgraduate course in tropical agroecosystems: facing the challenges for Mexican agriculture in the 21st century. *Agro Prod.* 13, 53–60. doi: 10.32854/agrop.v13i11.1812
- Gerharz, E. (2018). *The Interface Approach (3927276987)*. I. W. Papers. Available online at: <https://www.econstor.eu/handle/10419/183566>
- Giddens, A. (2011). *La Constitución de la Sociedad: Bases para la Teoría de la Estructuración, 2nd Edn*. México: Amorrortu.
- Gliessman, S. (2011). Transforming food systems to sustainability with agroecology. *J. Sustain. Agric.* 35, 823–825. doi: 10.1080/10440046.2011.611585
- Gliessman, S. (2012). Redesigning agroecosystems. *J. Sust. Agric.* 36, 381–381. doi: 10.1080/10440046.2012.662583
- Gliessman, S., and Ferguson, B. G. (2021). An urgent call for deep food system change. *Agroecol. Sustain. Food Syst.* 45, 1–2. doi: 10.1080/21683565.2020.1831731
- Hebinck, P., den Ouden, J., and Verschoor, G. (2001). “Past, present and future: long’s actor-oriented approach at the interface,” in *Resonances and Dissonances in Development: Actors, Networks and Cultural Repertoires*, eds P. Hebinck, G. Verschoor, N. Long (Assen: Royal van Gorcum), 1–16.
- Hendrickson, J. R., Hanson, J. D., Tanaka, D. L., and Sassenrath, G. (2008). Principles of integrated agricultural systems: introduction to processes and definition. *Renew. Agric. Food Syst.* 23, 265–271. doi: 10.1017/S1742170507001718
- Josol, M. R. C., and Montefrio, M. J. F. (2013). Understanding the resilience of Swidden agroecosystems interacting with rubber and oil palm production regimes in the Philippines. *Agroecol. Sustain. Food Syst.* 37, 812–833. doi: 10.1080/21683565.2013.775540
- Landini, F., Cowes, V. G., and Damore, E. (2014a). Hacia un marco conceptual para repensar la accesibilidad cultural. *Cadern. Saúde Pùb.* 30, 231–244. doi: 10.1590/0102-311X00030313
- Landini, F., Leeuwis, C., Long, N., and Murtagh, S. (2014b). Towards a psychology of rural development processes and interventions. *J. Commun. Appl. Soc. Psychol.* 24, 534–546. doi: 10.1002/casp.2187
- Larrión, J. (2019). Teoría del actor-red. Síntesis y evaluación de la deriva postsocial de Bruno Latour. *Rev. Españ. Sociol.* 28, 323–341. doi: 10.22325/fes/res.2019.03
- Latour, B. (1996). Do scientific objects have a history? Pasteur and Whitehead in a bath of lactic acid. *Common Knowl.* 5, 76–91.
- Leeuwis, C., Long, N., and Villarreal, M. (1990). Equivocations on knowledge systems theory: an actor-oriented critique. *Knowl. Technol. Policy* 3, 19–27.
- Long, N. (1990). From paradigm lost to paradigm regained? The case for an actor-oriented sociology of development. *Eur. Rev. Latin Am. Caribbean Stud.* 49, 3–24.
- Long, N. (2001). “The case for an actor-oriented sociology of development,” in *Development Sociology: Actor Perspectives, 1st Edn*, ed N. Long (Routledge: Taylor & Francis e-Library), 1–7.
- Long, N. (2007). *Sociología del Desarrollo: Una Perspectiva Centrada en el Actor*. Transl. by M. V. y. P. R. Horacia Fajardo. Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS) y el Colegio de San Luis (COLSAN), México.
- Long, N. (2015a). “Acercando las fronteras entre la antropología y la psicología para comprender las dinámicas de desarrollo rural,” in *Hacia una Psicología Rural Latinoamericana*, eds F. L. (Coordinador) (Buenos Aires: CLACSO Consejo Latinoamericano de Ciencias Sociales), 77–96.
- Long, N. (2015b). “Activities, actants and actors: theoretical perspectives on development practice and practitioners,” in *Constructing a New Framework for Rural Development*, eds Milone, P. Ventura, F., and Ye, J. Vol. 22 (Bingley: Emerald Group Publishing Limited), 31–58.
- Long, N., and Liu, J. (2009). The centrality of actors and interfaces in the understanding of new ruralities: a Chinese case study. *J. Curr. Chin. Affairs* 38, 63–84. doi: 10.1177/186810260903800404
- Long, N., and Long, A. (1992). *Battlefields of Knowledge: The Interlocking of Theory and Practice in Social Research and Development*. Routledge: Taylor & Francis Group.
- Long, N., and Villarreal, M. (1993). “Exploring development interfaces: from the transfer of knowledge to the transformation of meaning,” in *Beyond the Impasse: New Directions in Development Theory*, ed F. J. Schuurman, 140–168. Available online at: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-0027796117&partnerID=40&md5=b1c8f29bb57ea58cdf3da198dcd34c7b>
- Lugo Perea, L. J., and Rodríguez Rodríguez, L. H. (2020). *Perturbando el Texto Agroecológico: Anotaciones para una (Urgente) Des-Colonización de la Agroecología Ibagué: Colectivo de Pensamiento Agroecológico*. Ibagué: Sello Editorial Universidad del Tolima.
- Martínez, R. (2004). Fundamentos culturales, sociales y económicos de la agroecología. *Rev. Cien. Soc.* 1–2. Available online at: <https://www.redalyc.org/articulo.oa?id=15310407>



- Mason, R. E., White, A., Bucini, G., Anderzén, J., Méndez, V. E., and Merrill, S. C. (2020). The evolving landscape of agroecological research. *Agroecol Sustain Food Syst.* 45, 1–41. doi: 10.1080/21683565.2020.1845275
- Nawrath, H. I. M. (2010). *El Método Etnográfico: Origen y Fundamentos de una Aproximación Multitécnica*. Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, 11: 1–31. <https://hdl.handle.net/10925/618>
- Puentes, J. A. (2015). La hermenéutica como anclaje epistémico del método etnográfico. *Vivat Acad.* 1–11. doi: 10.15178/va.2015.133.1-11
- Roldán-Rueda, H. N. (2020). El rol de los actores en mercados locales y campesinos de México y Colombia. *Estudios Soc. Rev. Aliment. Contemp. Desarrollo Regional* 30, 1–30. doi: 10.24836/es.v30i56.1029
- Romero, Y. H., Ramos, G. A., and Muñoz, J. P. (2012). Análisis y configuración del desarrollo regional. Un enfoque desde los actores. *Espacios Públ.* 15, 188–207. Available online at: <http://hdl.handle.net/20.500.11799/39741>
- Sarandón, S. (2014). “El agroecosistema: un ecosistema modificado,” in *Agroecología: bases teóricas para el diseño y manejo de agroecosistemas sustentables*, eds S. Sarandón, and C. y Flores (Buenos Aires: Editorial de la Universidad de La Plata), 100–130.
- Sarandón, S. J. (2019). Potencialidades, desafíos y limitaciones de la investigación agroecológica como un nuevo paradigma en las ciencias agrarias. *Rev. Facult. Cien. Agrar. UNCuyo* 51, 383–394. Available online at: <https://revistas.uncu.edu.ar/ojs3/index.php/RFCFA/article/view/2458>
- Sarker, M. N. I. (2017). An introduction to agricultural anthropology: pathway to sustainable agriculture. *J. Sociol. Anthropol.* 1, 47–52. doi: 10.12691/jsa-1-1-7
- Sicard, T. E. L. (2009). Agroecología: desafíos de una ciencia en construcción. *Agroecología* 4, 7–17. Available online at: <https://revistas.um.es/agroecologia/article/view/117121>
- Tittonell, P. (2019). Las transiciones agroecológicas: múltiples escalas, niveles y desafíos. *Rev. Facult. Cien. Agrar. UNCuyo* 51, 231–246. Available online at: <https://revistas.uncu.edu.ar/ojs3/index.php/RFCFA/article/view/2448>
- Tittonell, P., Piñeiro, G., Garibaldi, L. A., Dogliotti, S., Olf, H., and Jobbagy, E. G. (2020). Agroecology in large scale farming—a research agenda. *Front. Sustain. Food Systems* 4:584605. doi: 10.3389/fsufs.2020.584605
- Tobin, D., and Glenna, L. (2019). Value chain development and the agrarian question: actor perspectives on native potato production in the highlands of Peru. *Rural Sociol.* 84, 541–568. doi: 10.1111/ruso.12251
- Turner, S. (2012). Making a living the hmong way: an actor-oriented livelihoods approach to everyday politics and resistance in upland Vietnam. *Ann. Assoc. Am. Geogr.* 102, 403–422. doi: 10.1080/00045608.2011.596392
- Ye, J., Wang, Y., and Long, N. (2009). Farmer initiatives and livelihood diversification: from the collective to a market economy in Rural China. *J. Agrarian Change* 9, 175–203. doi: 10.1111/j.1471-0366.2009.00191.x

**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Gallardo-López, Linares-Gabriel and Hernández-Chontal. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.