

# Understanding agroecological livestock paths in northern Uruguay

*Comprender los caminos agroecológicos de la  
ganadería en el norte de Uruguay*

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## ABSTRACT

Agroecology is emerging in Uruguay as an alternative production model. Understanding and interpreting the vision of farmers and rural technicians on the agroecological transition processes in the country is a challenge for research. The main hypothesis that motivated this study is that the views of producers and technicians on agroecology guide, frame, and structure the transition processes. This article presents the results of two focus groups carried out in 2020 with professionals from different institutions and family livestock farmers in the north of the country. They show the great diversity of visions and the different paths taken by farmers. Despite these different visions, some common ideas could contribute to defining an agroecological livestock farming model. These paths permit suggesting and evaluating differentiated proposals for developing agroecological family farming.

**Keywords:** Family farming. Agroecology. Focus groups. Socio-technical practices.

## RESUMO

A agroecologia está surgindo no Uruguai como um modelo alternativo de produção. Compreender e interpretar a visão de agricultores e técnicos rurais sobre os processos de transição agroecológica no país é um desafio para a pesquisa. A principal hipótese que motivou este estudo é que as visões de

*produtores e técnicos sobre agroecologia orientam, enquadram e estruturam os processos de transição. Este artigo apresenta os resultados de dois grupos focais realizados em 2020 com profissionais de diferentes instituições e pecuaristas familiares do norte do país. Eles mostram a grande diversidade de visões e os diferentes caminhos percorridos pelos agricultores. Apesar dessas visões diferentes, algumas ideias comuns podem contribuir para a definição de um modelo agroecológico de pecuária. Esses caminhos permitem sugerir e avaliar propostas diferenciadas para o desenvolvimento da agricultura familiar agroecológica.*

**Palavras-chave:** Agricultura familiar. Agroecologia. Grupos de foco. Práticas sociotécnicas

## 1 INTRODUCTION

Agroecology is an incipient alternative production model to Uruguay's current product-oriented dominant model. According to Altieri and Toledo, an alternative production model is understood as one that promotes national and local food production by family farms (and urban production systems) based on innovation, local resources and the use of alternative energies, such as solar energy (ALTIERI; TOLEDO, 2011). Since the approval of the National Plan on Production with Agroecological Bases (ANP), agroecology has begun to be implemented as a public policy (GAZZANO *et al.*, 2020). The ANP declares of national interest, "the promotion and development of production systems, distribution and consumption of agroecological-based products, both in their natural and processed state, aiming to strengthen food sovereignty and security, contributing to the environment care, in order to generate benefits that improve the life quality of the Republic inhabitants." (LAW 19.717/2019 Art. 1).

In addition, it declares family farmers and urban and suburban agricultural production systems as the main collective subjects of agroecological-based production systems. Besides, the Ministry of Livestock, Agriculture and Fisheries (MGAP, Ministerio de Ganadería, Agricultura y Pesca) recently called on agricultural production organisations to submit agroecological transition proposals (AT) through the "Agroecological Path" call<sup>1</sup>. This constitutes a propitious scenario to imagine new sustainable production systems based on biodiversity and respect for natural resources (GAZZANO *et al.*, 2020; POSADA RODRÍGUEZ *et al.*, 2020). In this context, understanding and interpreting the views of producers and agricultural technicians on AT processes in the territory is a challenge for this research, organisations and the State.

It is then a matter of moving towards a new situation, where the dominant productive model comes into discussion. Moving towards an agroecological production model would allow responding to the deterioration produced by the dominant socio-technical regime, which seems necessary and urgent (TITTONELL, 2019). Although research on family livestock systems in Uruguay has analysed their social, economic and ecological sustainability (ALBICETTE *et al.*, 2016; GAZZANO; GÓMEZ, 2017; MODERNELE *et al.*, 2018), not much research has been interested in studying these systems from an agroecological perspective, analysing the AT dynamics of Uruguayan livestock family producers (LFP) at a livestock production level. Some studies point to the need to better understand the management and conservation of the Natural Field (NF) carried out by LFP and, thus, generate changes through collaborative work between technicians and family producers (ALBICETTE *et al.*, 2016; DIÉGUEZ, 2014).

On the other hand, the country's beef exports have allowed it to access, through innovations and differentiation strategies, specialised niches of the high-quality meat market (PAOLINO *et al.*, 2014). Since livestock contributes approximately 40% of agricultural GDP (MGAP, 2021), the challenges of AT are even greater. The extensive livestock production system on natural field (NF) (predominant) began more than four hundred years ago with the introduction of livestock to the Pampas region of the Río de la Plata, giving rise to what was called Uruguay Pastoril (DOTTA *et al.*, 1972). This production system also determined the strong presence of a traditional type of LFP (family farmers) in the country, mainly dedicated to livestock breeding (RIBEIRO, 2009). These LFPs can be considered

a special type of family farmer, especially "breeders", dedicated to mixed bovine and ovine breeding, which do not include agriculture or beef finishing processes (ROSSI *et al.*, 2019). The advance of agricultural intensification processes led to the fact that today livestock farming competes for using natural resources with agriculture and forestry in the country (GAZZANO; ACHKAR, 2016). Between 2000 and 2011, the area of agricultural and forestry regions increased by 110% and 158%, respectively, while livestock decreased by 36% (MGAP DIEA, 2021). Even despite the evident progress of the intensive agriculture and forestry model promoted by agribusiness (GUIBERT *et al.*, 2011), according to the last General Agricultural Census, most of the area exploited in the country (39%) corresponds to livestock over NF (MGAP DIEA, 2014).

Regarding social stratification, there are 21,657 family farms in the country (MGAP DIEA, 2021), representing almost half the total number of farms compared to 2011. 65.4% of family producers declare cattle (meat or milk) or sheep (meat and wool) as their main production; most of them are based on NF (MGAP DIEA, 2021). Family lifestyle and their relationship with nature and the landscape are characteristic of a "gaucha" culture and tradition that prevail in decision-making in the Pampas region (RIBEIRO, 2009). They are families with low relative incomes, mainly due to their small scale, lifestyle and work, which determine the use of the family labour force and low technology incorporation based on inputs (DOGLIOTTI *et al.*, 2020). These livestock families persist and are grouped into grassroots organisations in the territory, developing individual and collective resistance to the advance of agribusiness, such as sectoral demands for land access policies and training and technical advice support (DÍAZ, 2021; ROSSI *et al.*, 2019).

Therefore, agricultural institutions have generated calls and projects in which technicians have been hired to work with family producer organisations. Among these calls, institutional strengthening, the promotion of technologies for family production and those aimed at women and young people were important (FRANCO *et al.*, 2016). Although, in many cases, these calls have reinforced technical assistance to LFPs and their organisations in the study area, strengthening family production involves advising, understanding, and respecting the singularities that underlie production systems, and even more so from an AT perspective.

The study's objective was to understand and interpret the vision that producers and technicians have about AT in the livestock territory of the north of the country, particularly discussing what the different actors understand about it and agroecology. Within this framework, it is assumed that the (re)construction of the agroecological family livestock production system will depend on its situation, objectives and the producers' vision of agroecology; therefore, this will guide the transition process. In this way, it is intended to contribute to the understanding of the role of public and private institutions and LFP organisations in the transition toward an agroecological production model.

The article is divided into four sections. The first section presents the conceptual theoretical framework. The second presents the methodology used. The results are presented in the third section, along with the development of the participants' perspective in the discussion groups on agroecology and AT and the analysis matrix that allowed us to interpret the different proposals or AT paths. Finally, based on the different visions and proposals of AT identified, we reflect on how the northern LFP move towards an agroecological production model.

## 2 AGROECOLOGICAL TRANSITION: MULTIPLE PATHS

The transition is not a recent issue. In the 1980s, Stuart Hill proposed redesigning production systems, highlighting the importance of profoundly transforming from conventional to organic agriculture. Although an AT was not specifically defined, the main relevance was placed on the human-nature relationship and the importance of the efficiency of chemical inputs use and change to organic inputs use (HILL, 1985).

In this sense, Gliessman (1998) mentions a series of necessary levels to move towards agroecology, which support the redesign of agricultural exploitation and the relationship between different actors (producers and consumers). Thus, we are approaching a construction thinking that starts from the individual but includes multilinear and scalar changes (ELZEN *et al.*, 2017).

In this study, AT is understood as a process of deconstruction/construction at the individual level, on farms, and collectively in the territory, which responds to the challenge of implementing processes of conception, selection and dissemination of innovations for an agroecological transformation (VITRY; CHIA, 2016). From this perspective, territories become devices where producers and technicians experience new practices, alliances and relationships (CHIA, 2018). The territory is key in the definition of what should be done to achieve agroecological production systems since it involves cultural aspects, identity and symbolic control over space (HAESBAERT, 1997).

The AT process is understood as socio-technical and organisational innovations and changes, a product of the interaction of multiple actors at different scales (local, national, regional), which brings into play multiple-dimensions phenomena (physical, political, technical, social, financial, and scientific). The aforementioned enables considering AT processes as complex and uncertain situations (CHIA, 2018). During this AT process, actors play an important role in the territory transformation through driving forces (MIER Y TERÁN *et al.*, 2018; TITTONELL, 2019), which allow changes and innovations. However, these are not linear but occur as a process of deconstruction/(re)construction produced by local actors in dynamic two-way processes of translations and multiple alliances where producers, extensionists and researchers come together to co-conceive innovations, implement them and evaluate them. This is what Geels (2002), in his theoretical proposal to analyse socio-technical transitions, calls niche innovations (changes and practices at the level of units and localities).

According to Geels (2002), transitions would result (i) from changes at the level of sociotechnical landscapes through national laws or programs that will modify relations at the level of sociotechnical regimes and favour some niche innovations; (ii) from changes in sociotechnical regimes that will determine changes in the landscape and innovation niches. To generate changes in socio-technical regimes, it is necessary that the actions decided in the socio-technical landscape and the actions carried out in the niches occur to modify the relationships between the different components of the socio-technical regime and (iii) due to the appearance of niche innovations, the product of new individual practices or small groups that will gradually modify the socio-technical regime by modifying the relationships and projects of the institutions. Thus, niche innovations generate new paths to move towards another way of producing or production mode.

In agroecology, the transition is seen as a set of processes, of simultaneous paths at different scales, levels and dimensions, where transformations at the level of trophic structures of soil communities and of the rural family with their roles and responsibilities (CLAVEIROLE, 2016; TITTONELL, 2019) are combined with those transformations at the socio-technical, political and cultural level in the territories (CLAVEIROLE, 2016; MIER Y TERAN *et al.*, 2018). Agroecology does not yet have a unanimous definition (ALTIERI, 2002), which makes it challenging to study, but at the same time, this non-consensus makes it potentially more interesting because it allows exploring it from different angles.

Among the theoretical debates on ecological modernisation, two forms of agroecology are mentioned (DURU *et al.*, 2014; HORLINGS; MARSDEN, 2011). The "weak" refers to a type of modernisation where good management practices are applied to improve the efficiency of external inputs and reduce environmental impacts. The "strong" form of agroecology corresponds to a paradigm shift, which seeks to replace classical inputs (chemical synthesis) with the use of the biological diversity of agroecosystems. It also seeks a new "design" of production systems based on the complementarity between productions.

As an example of the first form, the sustainable intensification proposal implies a gradual improvement process of the ecological efficiency of agricultural systems through innovation in order to tend to greater or equal productivity and profitability with less environmental impact on the maintenance and/or improvement of natural resources, reducing dependence on external inputs (HLPE, 2019). Alonso-Fradejas *et al.* (2020) say these measures reduce environmental problems. However, negative effects still occur since it is an approach aimed at maintaining the established order of agri-food capital and simultaneously incorporates discourses, practices and processes typical of an agroecological approach. For the second form, a systemic approach that aims at the (re)conception and co-conception of agricultural systems through the mobilisation of biodiversity is required (DURU *et al.*, 2014). This form is more complex since it is necessary to review the management models of farms, social and rural organisations and resources in a territory, all accompanied by public policies that support this transition (DURU *et al.*, 2014; HORLINGS; MARSDEN, 2011).

These are individual and collective changes that involve multiple innovations at different levels. Niche innovations (GEELS, 2002; TITTONELL, 2019) require new coordination capacities between actors and specific learning, such as systemic thinking, organisational dynamics, and knowledge hybridisation (VITRY; CHIA, 2016). Due to the complexity of changes at all levels, there may be several paths in the transition, according to the characteristics of productive models and innovations, and therefore, these paths may more or less bring productive systems closer to being agroecological. This research also aims to contribute to documenting this controversy between weak and strong agroecology to better understand how complex agroecology is.

### 3 METHODOLOGY: A COMPREHENSIVE APPROACH TO AGROECOLOGY

The research was conducted in Salto and Tacuarembó (northern Uruguay), characterised by extensive cattle ranching on NF (MGAP DIEA, 2021). The methodology used was the discussion groups (DG), which responds to the qualitative research approach of a comprehensive type and was selected to facilitate an approach to the actors' point of view. The use of this technique was justified with the idea that what is said individually is different from what is said in a group (COMPAGNONE; SIGWALT, 2021) since the group generates a feeling of belonging that contributes to the security of sharing information (ONWUEGBUZIE *et al.*, 2011). In addition, the technique allows quick and efficient data generation (KRUEGER; CASEY, 2000).

Participant selection criteria were based on information that emerged from two exploratory interviews conducted with qualified informants from the region who carried out a development of the present institutionality and the development of innovations of interest to study MT in livestock, such as the control of the grazing load according to the availability of dry matter in NC and the use of biological control of ticks with native entomopathogens.

Two DG were carried out. One was composed of 10 agricultural professionals who belonged to the public and/or private institutions present in the region and were linked to rural organisations through program-projects or linked as private technical advisors. The other DG comprised seven LFPs linked to social-rural organisations in the region and were involved in programs with some of the process technologies that were defined as of interest for research. According to Onwuegbuzie *et al.* (2011), the DGs were formed between 6 and 12 participants to generate diverse information within the group without inhibiting the exchange of different opinions, experiences or beliefs.

Each DG took half a day of work, and their specific objectives were to explore the vision of the technicians/producers and their institutions/organisations regarding agroecology and AT, to understand the role that institutions/organisations are playing in the implementation of innovations (changes in the management practices and process technologies) and what they imagine the action strategies for an agroecological transition will be. In both groups, individual work and group workshops were combined with sharing and plenary discussion.

## 4 RESULTS AND DISCUSSION: MULTIPLE VISIONS AND PATHS

### 4.1 TECHNICIAN DISCUSSION GROUP

There was agreement on the need to reconstruct, at the territorial level, what is thought about agroecology in interaction with agricultural institutions and with the professionals who work in it, taking advantage of collective actions to identify key drivers of changes or innovations.

Some limitations were identified within the institutions to promote AT, where "the institutions' own mandates stand out since there is no clear definition of agroecology". The participants consider that it is more by omission than by opposition to agroecology, although they agreed that the idea is that agroecology "is for hippies [...] utopian, difficult to achieve" and that some referents of the institutions "downplay the importance of agroecology, and even make fun of certain management practices such as Voisin grazing, and that has a tremendous impact on producers." In any case, "there is a vision of promotion, dissemination of ecological alternatives for life and production, based on the fact that society needs to know what is up for change, co-innovate, create, alternatives and change".

The role of some projects that contributed to discussing ways of producing was highlighted, such as those of the Program "More Technology for Family Production"<sup>2</sup>, which promoted more careful management alternatives with the environment under the modality of research-action-participation, where the joint work between institutions and organisations was key. The cognitive role and the need to innovate in the way of thinking about livestock production were problematised. Will is necessary to generate "a change in consciousness" for technicians "wanting to change and make the decision" is put first to start the path of AT. Contrary to what might be expected, the DG of professionals did not emphasise the need for transformations/innovations for AT from a technical-productive dimension. Instead, it prioritised the cognitive dimension (the will to change) and the role of projects as drivers of innovations from the institutional, although not necessarily linked to a transformative vision of the production mode.

### 4.2 LFP DISCUSSION GROUP

There was agreement on the need for their organisations to discuss the concept of agroecology and what they understand by TA, highlighting as the main instrument the peer dialogue and maintaining the support of the institutionality present in the territory (through technical, social and productive accompaniment) in the processes of change. In this regard, farmers highlighted that the projects that "landed" in the area provided technical, social and productive advice support and enabled access to different types of training, from how to form a group to sheep and beef health courses. Thus, it was worth noticing that "since the organisation of the area, we have had many possibilities for growth, for the technicians to train us, for the SUL, the INIA, the IPA3 to come, all with different projects or informative talks [...]". It is necessary "among all [...] to make our voices heard because we need things, learning and technicians to support us. We are willing to change, we are!"

This DG's perceptions of agroecology are based, above all, on how they relate to nature, the environment and how they produce. The reflections cover the environmental and productive dimensions, leaving aside group work's social and cultural dimensions. The producers stated that agroecology "means taking care of the environment in general and not depending on chemicals", "preserving the "countryside" in an ecological way, avoiding the use of agrochemicals, because a similar result can be achieved ecologically", or "The most natural and the least harmful way to the development of production, to obtain a healthier diet and the well-being of the environment".

For this DG, agroecology is not yet associated with a comprehensive way of producing, marketing, relating and living. However, many issues from work in their organisations finally lead them to reflect and imagine from other dimensions that are part of integral thinking associated with agroecology, especially when it comes to changes and innovations that make them move towards other models of production and life. In addition, in this situation of redefinition for LFP, the role of organisations as promoters of these changes appears since the organisation structures their position towards innovation differently, not only because access to information and different projects increases but because peer-to-peer communication is enriched.

### 4.3 COMMON VIEWS

The role of institutions and organisations in proposing changes in the region, building identity and generating collective actions was highlighted. This construction of collective identity defines the socio-technical framework for actions that deconstruct ways of producing, living, and reconstructing others.

The importance of experiencing situations that force "clicking", which operate as key drivers on the path to AT (MIER Y TERAN *et al.*, 2018; TITTONELL, 2019) was highlighted. These key drivers in a territory can act interrelated or not, even being linked to a certain crisis which drives to seek alternatives through social and/or rural organisations, opportunities through public policies or other territorial devices, such as precautionary measures for the protection of a basin.

Among the professionals, the "undisputed role of organisations in the construction" of agroecological systems was mentioned as the "importance of a collective and not individual construction";, while among the producers, the importance of reaching "from organisations and institutions to those people in the rural environment" who above all are open "to dialogue between peers" was highlighted, since "the producer used to be individualist, but now it points to the collective; before, the producer was "I"... there are still some, but now we are "we".

In general, the necessary changes to imagine a livestock transition to agroecology discussed in the DG referred to innovations in management practices promoted by the organisations through talks, training and projects that reach rural organisations and where technicians participate as part of the institutionality in the territory. In this sense, the frame is an interesting one since AT always begins with changes in the management practices of a productive system, although ideally, it is considered that it should begin with a redesign of the agroecosystem, with the consequent change in management practices (TITTONELL, 2019). They are ways of producing positioned in intermediate phases between weak and strong agroecology. This must also be considered because AT, seen as a process of change towards a different mode of production, depends on the territory specificities, not only biophysical but also economic, social and institutional.

### 4.4 ANALYSIS MATRIX FOR AGROECOLOGICAL TRANSITION

To understand and analyse the diversity of opinions and points of view of the technicians and LFP, an analytical matrix facilitated the understanding and interpretation of the DG results in answering the following question: where is it going?

The matrix was designed considering the theoretical framework of Geels (2002) to analyse socio-technical transitions, in this case, transitions towards agroecology. Geels proposes to identify three levels of action, (i) the sociotechnical landscape, in this case, marked by the PNA and the Agroecological Path call in livestock production in northern Uruguay; (ii) the sociotechnical regimes, configured in the relationship between public and private institutions and the LFP in the different production paradigms; (iii) the niche innovations, defined by changes in practices such as in this case the use of bioinsecticide for ticks, or the adjustment of load by measuring grass height.

Considering family farming in northern Uruguay, the horizontal axis in Figure 1 represents the trajectory of AT between two production paradigms or models, from productivist agriculture to agroecological agriculture. The vertical axis also represents the action levels of the innovations involved in AT, defining the extremes from the individual to the collective level. The crossing of these two axes produces four quadrants: three represent situations in which innovations are developed in livestock farming in northern Uruguay (quadrants 1, 2 and 3), and one represents the situation of agroecology as an ideal situation to be achieved by AT (Quadrant 4).

Within each quadrant, the characteristics associated with AT paths are described according to four variables, (i) technical objectives: aspects of production are visualised; (ii) marketing: the marketing channels associated with each form of production are observed; (iii) territory: it is the relationship of the actors with the territory; (iv) coordination: it is the relationship of the actors with the other levels (institutions, organisations, markets).

		Collective Level				
		Quadrant 1		Quadrant 4		
Productivist agriculture		<b>Objective:</b> sustainable intensification (increase in productivity per hectare), reducing external inputs		<b>Objective:</b> change productive paradigm, redesign of productive systems	Agroecological agriculture	
		<b>Marketing:</b> internal and external market		<b>Marketing:</b> short circuits		
		<b>Territory:</b> support of production and collective relations		<b>Territory:</b> it is an organised whole		
		<b>Actors coordination:</b> Market Oriented		<b>Actors coordination:</b> through common projects of the organisations		
		Quadrant 2		Quadrant 3		
		<b>Objective:</b> sustainable intensification (increase in productivity per hectare) and single production.		<b>Objective:</b> niche innovations that introduce changes in the socio-technical regime: (native bioinsecticide for ticks, animal load management).		
		<b>Marketing:</b> external market		<b>Marketing:</b> internal market		
		<b>Territory:</b> inclusion of producers in agri-food value chains		<b>Territory:</b> incipient focused experiences		
	<b>Actors Coordination:</b> Across Industry/Certification		<b>Actors coordination:</b> based on individual and group experiences			
		Individual Level				

**Figure 1 |** Analysis matrix of the different agroecological transitions for Uruguayan livestock

*Source: Prepared by the author.*

From this logic, Quadrants 1 and 2 correspond to two AT situations that we can consider closer to the current paradigm of productivist agriculture. In Quadrant 1, collective innovations predominate, which we refer to as "regenerative agroecology". In Quadrant 2, innovations of the property type or "behind the gates" predominate and we refer to them as "industrial agroecology". Quadrants 3 and 4 are situations closer to the agroecological paradigm, and the location between the upper and lower



quadrants depends on the type of innovations and relationships with the territory. The study shows some niche innovations that can be located in Quadrant 3, being "seeds" that can "germinate" in the territories to reach strong agroecology situations in the future. This quadrant was called "agroecology in incubation".

The AT visions of most of the DG participants can be interpreted as transition situations that can be located in Quadrants 1, 2 and 3. Certain adjustments in management practices are mentioned to improve the efficiency of external inputs, but only by reducing their pressure and to reduce environmental impacts at the property level (for example, precision agriculture or use of resistant varieties) associated with sustainable intensification. Suppose these views are analysed from the niche innovation standpoint. In that case, changes in management practices comprise a reductionist vision in associating niches with technological changes linked to the dominant socio-technical regime, whose axis is the increase of productivity. Although most public or private institutions do not yet have an explicit or consensual position on agroecology, they promote programs or projects to encourage "more sustainable production". In this line, we find natural pasture management projects, the introduction of service crops in agricultural rotation, among others, driven by research and transfer institutions and focused on the sustainability of productive systems.

**"Regenerative" Agroecology:** Quadrant 1 represents AT situations originating in crises or individual experiences of producers in direct relation to the conservation/regeneration of the resources available on their property. In this situation, niche innovations are looking for solutions with resources from the property itself, for example, land use intensification and subdividing into plots to manage pastures. Both DG provided examples of innovations that solve the effects of previous mismanagement on the property due to the need to avoid further degradation of natural resources, even to the detriment of production, but avoiding the use of external inputs. According to what is expressed in the professionals' DG, in these cases, the drivers for change are varied, from a talk with neighbours, projects or programs developed through organisations, to a field activity of an institution, at the territorial level.

**"Industrial" Agroecology:** the visions represented in Quadrant 2 are related to the niche innovations proposed by the market, which promote the inclusion of producers in agri-food value chains for export. Individual action is privileged, with technical proposals to improve the production system. Modifications are proposed within the current socio-technical regime but without transforming it. Innovations in the techniques and technologies that follow a protocol regulated by certifications for selling products in the export market are found in this quadrant. In the DG, examples were given on selling organic meat and certifications for sustainable and organic wool, which mainly correspond to wool from mixed establishments with an organic certification of beef production programs of cold-storage plants. The driver of change for these transformations are the industries themselves, according to market opportunities, who lead the way, and the drivers at the producer level are the value added to their production.

**Agroecology "in incubation":** in Quadrant 3, although there are clear commitments and ideas from some technicians, only a few think about the need for an AT and a displacement of the current socio-technical regime, mainly through the generation of niche innovations that are being installed little by little. In the DG of the producers, "producing without chemicals and living in accordance with nature" emerged as a felt need, and decisions were made for this purpose. Examples of innovations emerged with rotary grazing practices or rational grazing and the introduction of biological control (native bioinsecticide for ticks), among others. These innovations do not yet generate a redesign but drive changes in production logic.

**Agroecology:** Quadrant 4 shows the "objective" transition situation, in which there is the advance of a new socio-technical regime that would displace the current hegemonic one. Changes are promoted at different levels in family production systems and rural organisations, which generates niche innovations with the management of material resources in the territory through interaction and work with institutions and through public policies developed to accompany the AT. The type of action

required here is collective, and innovation is seen from a socio-technical perspective. This innovation is considered virtuous because it contributes to resilience and the fight against climate change in addition to installing agroecology, without forgetting that the participation of producers allows them to improve their innovation capacities by generating territorial learning necessary for the proper functioning of agroecology (CHIA, 2018; VITRY; CHIA, 2016). According to the participants of the DG, it is considered that even this strong agroecology is still in the early stages in Uruguay, and not everyone has a clear understanding of this perspective. In only one of the participating institutions of the DG of professionals, agroecology is part of the mission and vision, integrating the paradigm of production and development it seeks. In the rest, the position taken regarding agroecology has not been defined, nor is it part of its institutional mandate.

Alonso-Frajedas *et al.* (2020) mention that types of practices related to agriculture adapted to climate change, sustainable or ecological intensification, and industrial production of organic monoculture food, among others, are efforts of the co-optation of agroecology to refine the industrial food system. Looking at the matrix, in quadrants 1 and 2, the deconstruction devices align with the idea of the sustainability of the systems but without departing from the markets' rules or the dominant socio-technical regime, which aims to improve the systems' productivity rather than also focusing on the social inequality they cause.

Some researchers consider that these technologies are false solutions, referring to the fact that they are technological solutions but from a power perspective, where the industry is the one that marks the path which must be transited to generate sustainable merchandise, with the aim of marketing in certain specific market niches (PETERSEN; MONTEIRO, 2021). Producers are "tied" to these forms of production, and in a certain way, they manage their production not regarding nature but to the market. In short, the current hegemonic socio-technical regime of increased productivity and access to the global market is reproduced and fed, far from an agroecology that not only seeks to build a relationship of affection between nature and society (PETERSEN; MONTEIRO, 2021) but also promotes a political-institutional and structural change at the territorial level.

On the other hand, the situations of AT of Quadrants 3 and 4 tend to improve the relationship between nature and society based on respect for their own natural resources, with a strong process of recovery, which appeals to the rescue of ancestral knowledge. In Quadrant 3, however, the demand for the necessary structural change at the territorial level is unclear, where they can implement their own devices to promote food sovereignty and modify the predominant socio-technical regime. In this sense, it is important to highlight the role of public policies in terms of putting devices into operation that implement Law 19,717 on agroecological-based production in the territories.

## 5 CONCLUSION: PATHS AND PERSPECTIVES

The results confirm that the visions of the LFP depend on their property and family situation. Also, collective action at the territorial level structures production systems and agroecological practices, confirming that the paths or transitions to agroecology are multiple.

The comprehensive approach of the study highlighted the important role that actors and territories play in the deconstruction/reconstruction processes of the practices, strategies and visions from which the new agroecological production systems are implemented. The agricultural institutionality and rural organisations of the territory appear as key actors in the (re)construction of the new identity of the LFP through the generation of innovations and new ways of producing, which validates the role of the territories in the work of deconstructing actions to build new identities through new devices (public policies, institutional projects). However, from the perspective of agricultural professionals, deconstruction/(re)construction of what is thought about agroecology within institutions is a priority to then discuss the possibilities of generating key drivers of change.

The analysis matrix made it possible to interpret different paths of AT and ways in which innovations are introduced, involving from co-innovation methodologies and participatory action research to individual or group technical advice. Based on the different AT paths identified in family farming, it is possible to distinguish between situations of weak agroecology, some of which were adjectived as industrial agroecology and regenerative agroecology and others, such as those related to NF management or the use of bio-inputs, appear as innovation niches to begin a change in production logics.

Regarding the practices implemented, the results show that the northern LFPs do not take the same AT paths. This is important to consider when developing actions to accompany, support and guide the implementation of public policies. The paths towards strong agroecology in the north of the country seem to be multiple, and there is no dominant at the moment. In addition, thanks to different projects, FLPs are moving along different paths toward an agroecological way of production. The steps that guide these transformations result from the actors' interaction, either between producers (peer-to-peer dialogue) or by exchanging with professionals in the projects being developed. From these exchanges, socio-technical agreements and associated knowledge (enhancing local knowledge with the technical) arise, which affirm the need to conserve natural resources and promote the persistence of the family in the countryside. The situation generated by Law 19,717 and the call for organisations to participate in the Agroecological Path seem to be two opportunities to (re)build niche innovations that contribute to new socio-technical regimes, which allow for a transition towards a "strong" agroecology.

## NOTES

1| The call for "Agroecological Path" projects was made in 2022. Available at: <https://www.gub.uy/ministerio-ganaderia-agricultura-pesca/comunicacion/noticias/send-a-agroecologica-convocatoria-propuestas-transicion-agroecologica>.

2| The MGAP, through the DGDR General Direction of Rural Development (DGDR) and with the support of the National Institute of Agricultural Research (INIA) within the Family Production Program, made 2 calls for projects to promote and develop appropriate technologies for family production, the first in 2014 and the second in 2016 <https://www.gub.uy/ministerio-ganaderia-agricultura-pesca/comunicacion/convocatoria/tecnologias-para-produccion-familiar>.

3| SUL: Uruguayan Wool Secretariat, INIA: 4.1.1 National Agricultural Research Institute, IPA: Agricultural Plan Institute.

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