

## Training for alternative livestock practices: from agroecological to educational innovation

Madelleine Mirabal-Cano <sup>a</sup>, Fanny Chrétien <sup>b</sup>, Nathalie Girard <sup>a</sup>

<sup>a</sup> Université de Toulouse, INRAE, UMR AGIR, 31320 Castanet-Tolosan, France

<sup>b</sup> Université de Bourgogne Franche-Comté, Agrosup Dijon, UR FoAP, 26 Bd du Dr Petitjean, 21000 Dijon, France

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**Abstract:** The agro-ecological transition and its linked paradigm shifts are deeply transforming the work of farmers as well as that of extension agents. The latter are compelled to act as change agents, taking local particularities and farmers' singularities into account, facilitating and guiding the expression of farmers' problems more than providing standardized recipes. In this context, it is essential to explore how the training provided by extension agents enables the professional development of farmers and strengthens their capacity to transform the work of both of them. To contribute to this issue, our article aims at describing the educational strategies of the extension agents who are experts in grazing feeding. We also seek to identify the difficulties and questions that these agents face. To do this, we conducted semi-directive interviews with these agents about their professional trajectories, intentions and practices. We also observed these practices in training situations. Finally, in a collaborative perspective of reflexivity, we discussed our first analyses with them in order to together formalize the pedagogical innovations to be tested. We thus show that their advisory and training activity as well as their shared ambition to contribute to the development of less artificial livestock farms are strongly rooted in technical expertise and in the method they have designed. In spite of this, they use different training strategies and positions and express a diversity of theories on learning and on the development of farmers' skills, which are not shared among them. Although they adapt their educational service to territorial specificities and demands, they encounter many difficulties such as the heterogeneity of their audience, the appropriation of innovative knowledge, and the link between the transmission of knowledge and its practice by farmers. The link between collective training and individual support seems to be the key both to pragmatizing the knowledge transferred and to enhancing the learning potential of each individual's professional experience. Educational reflection, both on an operational and a scientific level, is then essential to examine the link between training and support in order to encourage the development of know-how for the autonomous change of farming systems. This research is based on a research-intervention setting that is particularly promising for this purpose: it will enable us to explore the ways in which the capacities of stakeholders are built in order to engage in the agro-ecological transition and to experience the innovations it implies in terms of the way they work with the living world.

**Keywords:** agroecological transition; livestock farmer; grazing feeding; vocational training; pedagogical practices.

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## Introduction

The ecological transition of agricultural systems is qualified by many authors as a “paradigm shift in agriculture” (Ollivier and Bellon, 2013), in which both agronomic theories and vocational practices evolve at the same time (Cerf *et al.*, 2011). Agroecological production systems are thus evolving, imperfectly known, and subject to many hazards. As a result, they cannot be completely controlled, calling upon farmers to take the unforeseen variability and doubt about their actions into account (Brédart and Stassart, 2017), thus deeply changing their work (Coquil *et al.*, 2018). For example, the agroecological transition of livestock farms implies the development of practices and systems that enhance the value of semi-natural vegetation (natural meadows, summer pastures, etc.) and that limit the distribution of cereals and concentrates. Such practices require innovative management practices with complex dynamics, both in terms of the animals (dietary balance, health status, feeding behavior) as well as of the vegetation (spatial heterogeneity, seasonal evolution, multi-year evolution). Such contextual variability across space and time may be productive (Bell *et al.*, 2008) as long as the farmers know how to seize these opportunities. Such transitions thus create increasingly complex work situations and require more detailed and local diagnoses, taking “the social and biophysical idiosyncrasies of a particular farm” into account (Lyon *et al.*, 2011). As a result, the agroecological transition requires deep

changes in the professional development of farmers in the way they learn through action and adapt their practices (Chantre AND Cardona, 2014; Cristofari *et al.*, 2018; Toffolini *et al.*, 2019), as well as in the way they redefine their objectives. Developing new capacities and strengthening a reflexive and autonomous path are thus at the core of the agroecological transition for farmers. However, the question of how to teach farmers agroecological innovations remains open for those who guide them in this transition. This communication thus aims at contributing to the educational challenges of training design for agroecological innovations.

### Conceptual framework and scientific questions

This transition towards agroecological practices emphasizes a plurality of knowledge systems (Coolsaet, 2016). It questions the circulation of knowledge (Compagnone *et al.*, 2018; Girard, 2014) and the Transfer of Technology approaches of rural extension (Landini *et al.*, 2017; Warner, 2008), which have shown their limits in producing pragmatic changes. Agroecology thus goes hand-in-hand with other social dynamics, renewing relationships between research and development, learning modes between stakeholders (Hazard *et al.*, 2018) and frameworks for learning analysis within professional groups (Ingram *et al.*, 2014; Morgan, 2011). However, as Landini *et al.* (2017) emphasized, there is a lack of a new paradigm for thinking about extensionists' learning processes, calling for more research on innovative training and learning practices. In particular, Cerf *et al.* (2011) have put forward the need to investigate how the agent's subjectivity is a key driver of a change intervention, whereas only a small number of empirical studies have been devoted to the analysis of links between farmers' vocational development and training frameworks implemented by extension agents. Within this context, this paper contributes to exploring ways in which extension agents intend to build farmers' capacities within training situations in order to respond to such deep transitions in their work through education and professional development.

This research is part of a larger project aimed at characterizing the conditions of farmers' professional development when engaging in agroecological practices. We grounded our research in education and management sciences, which provide us with the theories and methodologies necessary to investigate the socio-cognitive conditions that can facilitate the appropriation of innovative knowledge by farmers and their pragmatization process (Pastré, 2002) on their farms. In this project, our objective is to explore which conditions encourage livestock farmers to learn an innovative approach to their work for animal feeding. We based our research on a didactic intervention approach (Cerf and Olry, 2018) carried out in collaboration with extension agents who were both experts and trainers in the domain of livestock grazing.

In this paper, we investigate the activity of a team of trainers who design training sessions for farmers. This activity, which covers the work, the pedagogical engineering and the design (Olry and Vidal-Gomel, 2011), is distributed among the different trainers and is carried on in real, face-to-face situations with farmers. We thus seek to describe how these trainers think about and implement pedagogical engineering for training courses for farmers.

To do this, we analyze the activity of trainers as a system involving other people, tools, rules, goals and leeway, in line with Vygotsky and Leontiev. More precisely, we rely on Engeström's (1987) proposal to represent this system of activity as a dynamic mediation between the subject's acting and learning in interaction with social structures that are themselves in movement.

Following Albero (2010), we apply this model to the activity of trainers when designing training sessions, which then combine three dimensions:

- **The ideal framework**, which includes "the set of ideas, principles, models and values that guide and structure the decisions, actions and discourses of the stakeholders during the project";

- **The strategic training system**, which is a combination of operational means finalized towards a goal. It is "the practical implementation of the ideal framework, the viable project explained in discourses, texts and documents (definitions, planning, stages, evaluations)". This redefinition is a pragmatic and situated adaptation of the ideal system, i.e., adapted "to the pedagogical, economic and material realities of the moment". It is therefore what each trainer defines for himself in relation to the guidelines shared between the trainers. Doing so, the trainer pursues a work object, in this case, the transmission of the farmer's learning and knowledge about grazing, by using tools designed within the community, according to the division of labor at work;
- **Experiential training** that corresponds "to the personal experience of the different stakeholders (decision-makers, teachers, technicians, trainees) and to their continuous development". It depends on the stakeholders' characteristics, their history, aspirations and dispositions, roles and status.

## Material and methods

This paper is based on an empirical analysis of the activity of a French SCOP<sup>1</sup> that is active in the domain of agriculture and the environment ("SCOPELA")<sup>2</sup>. More precisely, the activity of SCOPELA members is focused on livestock practices and systems that attempt to use semi-natural vegetation to feed their animals instead of buying food or sowing temporary pasture. We consider these practices as agroecological in that they attempt to "work with" the existing biodiversity of the plant cover rather than artificializing it.

Moreover, we consider this approach as innovative since it breaks with the knowledge and methods disseminated by agricultural education and learned by most farmers. Firstly, it advocates the idea that almost every plant can be eaten, even those that are considered invasive and useless for animal nutrition, such as woody plants or bramble. Secondly, the tool disseminated by SCOPELA (called "Pâtur'Ajuste") encourages farmers to reflect through a systemic perspective. It is based on the relationships between the different entities of their systems (vegetation, herd, farmer), seen as being dynamic (Agreil and Greff, 2008). This is an *"interactionist vision in which what constitutes a resource is not intrinsic to the plant cover [...] but is built into the relationship between vegetation, herd and farmer through the development of the latter's skills"* (Girard et al., 2016). Finally, farmers are called on to analyze their own current practices (allocation of batches to plots, duration, distributed feeding, etc.), as well as their links with the dynamics of the vegetation present on their farmland (growth and development of plant species on a seasonal, annual and multi-annual scale) and of the herd (animal capacity to graze plant cover, training of young animals, etc.), in relation to their objectives and global strategies (importance of inputs and mechanization, work organization, commercialization chain, etc.). According to SCOPELA, decision-making autonomy is based on the farmer's ability to distinguish between the objectives, the means used and the results obtained, revealing the "chains of causality" between the different entities of the system (vegetation, herd, farmers' practices).

Transferring such an innovative approach aimed at reinforcing farmers' technical, cognitive and decision-making autonomy thus constitutes an educational challenge. In particular, SCOPELA trainers have to change farmers' representations and deconstruct many preconceived notions on the feeding value of some plant covers (Girard and Magda, 2018).

In order to describe the educational strategies of SCOPELA agents, we:

<sup>1</sup> A SCOP is a Cooperative and Participative Association

<sup>2</sup> <https://www.scopela.fr/>

- Carried out semi-directive interviews with all of the SCOPELA extension agents (six, from October 2019 to January 2020) with whom we explored their academic career, professional trajectory and involvement in SCOPELA, and the Patur'Ajuste network. We also discussed their practices with them during the training days: preparation and role of local agents, audience, training objectives, tools and difficulties;
- Observed training sessions carried out by each SCOPELA agent during the fall of 2019 in three different regions (Brittany, Pyrenees, South Massif Central), and also allowed time for debriefing with the trainers;
- Presented our analysis during a meeting between researchers and trainers (January, February, May, September 2020) with the objective of discussing their own practices and difficulties with them.

The entire corpus (interviews, observation notes, transcribed meetings and debriefings) was structured in a database using NVivo Computer-Aided Qualitative Data Analysis Software. The work was then inductively analyzed and coded using a strategy similar to the "grounded theory" that consists of systematically comparing data units and gradually building a system of categories (Langley, 1999). The analysis was thus carried out by combining a descriptive coding step, close to the data, and an analytic coding step (or "axial coding", according to Strauss and Corbin, 2004), making it possible to assign conceptual categories to the segments of the corpus. Going back and forth between the corpus, these codings and our conceptual framework, we were able to build and stabilize our analysis and to characterize the intentions and objectives of the agents, the targeted audience, the methods and tools they use, what they think about didactic progression and to pinpoint learning difficulties for trainees.

## Results

### An ideal framework

#### *A common ambition and shared expertise*

The SCOPELA community is composed of six members who have followed various training and career paths prior to their involvement in this cooperative structure (Table 1). However, their visions of agriculture converge and are reinforced when they meet and become involved in the SCOP. They all founded - or joined - the SCOP as a result of their shared commitment to agricultural development. Their ambition is to contribute to the decision-making autonomy of farmers, to better develop a territory's resources, and to limit mechanization and inputs, *i.e.*, "to support the transition from agriculture to productive agriculture at the local level, more centered on ecological processes, less oriented towards the artificialization of surfaces, and based more on the development of local know-how" (Patur'Ajuste network charter, 2013).

SCOPELA's activity is, according to their website, defined as being at the crossroads between "advising and training" ([www.scopela.fr](http://www.scopela.fr)). Most of the time, its activity is included in the framework of public, European or associative funding. Whereas it is common to separate training from advisory activity, SCOPELA advocates a dual contract with farmers and local extension agents. This means that SCOPELA's activity combines training and advising, sometimes within face-to-face advisory interactions with a farmer and sometimes during formal training sessions that are part of their professional development (without formal qualification or accreditation). It is therefore not surprising that SCOPELA members express an ambiguity, even a divergence, with respect to their professional identity. As a common rule, they refuse to be technicians that only provide recipes but nevertheless accompany many livestock farmers on a technical level. Some of them, but not all, assume themselves to be trainers.

Indeed, they have learned by doing to become trainers, in a self-taught way. They have some implicit knowledge about pedagogical aspects, but this pedagogical dimension of their activity remains little formalized.

| Trainers | Background  | Professional background prior to SCOP  | Commitment and role in SCOP   |
|----------|---|--|---|
| T1       | Molecular Genetics Biologist<br>Thesis in ethology                                | Researcher at the French National Institute for Agronomical Research   | 2011 - Founder of SCOPELA, designer of the method<br>Wants to give more training to stakeholders working in the field   |
| T2       | Agricultural engineer   | Project Manager in a Regional Natural Park   | 2011 - Founder of SCOPELA, designer of the method<br>Proposes a " <i>real technique</i> " to those in alternative agriculture   |
| T3       | Ecologist, specialized in phytocology   | Engineer at the Institute of Animal Breeding   | 2011 - Founder of SCOPELA, designer of the method, retired  |
| T4       | Agricultural engineer, specialized in animal feeding behavior                     | Local officer in charge of the valorization of vegetation for ruminant feeding   | 2013 - Pâtur'Ajuste network facilitator<br>Promotes an innovative approach to the " <i>link between animals and farming practices</i> " in order to use semi-natural areas                      |
| T5       | Agricultural engineer, specialized in agricultural and environmental anthropology | In charge of accompanying people with agricultural projects in an association for the development of agricultural and rural employment | 2016 - In charge of the socio-economic analysis of changes in farming practices<br>Promotes " <i>the technical approach that has a political background to defend alternative agriculture</i> " |
| T6       | Agricultural engineer   | Internship on the socio-economic evolution of changes in pastoral practices at SCOPELA   | 2018<br>Promotes an approach where " <i>farmers are able to control the state of their vegetation through grazing</i> ".  |

**Table 1. Professional background of SCOPELA members.** Source: authors.

The SCOPELA community is also recognized for its technical expertise, at the crossroads between the ecological dynamics of vegetation, animal feeding behavior and a systemic analysis of feeding practices. The community members then share this expertise and the associated mediating artifact (the Pâtur'Ajuste method), although it was designed by some members of SCOPELA, while others, more recently arrived, have been trained in the method. At present, they claim that each of them plays the same role in the community, in a very horizontal division of labor.

Moreover, the rules shared by the community can be found in the "management philosophy" of the Pâtur'Ajuste approach (Girard *et al.*, 2016). It does not aim to provide "recipes" for farmers but, instead, a tool for farmers to autonomously rethink their practices, or even their objectives, based on the idea that "*farmers must keep control over their system*" (T1, 13/02/2020). The aim is to encourage farmers to make their own way by defining their objectives, adjusting their practices to their territory and over time, within a "management philosophy" characterized by a constant search for dynamic adjustment to the situation (Girard *et al.*, op.cit.). There is therefore "*not a single optimum to be discovered, but several possible optimums to be built: Patur'Ajuste proposes indicators to monitor and adjust plant, animal and practice dynamics over time rather than to identify an optimum that the farmer should conform to*" (Girard



*et al., op. cit.*). Nevertheless, the trainers also provide a range of technical levers from which farmers can take what they believe to be relevant to adjust their practices. However, they are not completely convergent in their transformative project: some seek to promote changes in farm practices, while others, on the contrary, aim at a more cognitive transformation. According to members' objectives, this method is also potentially compatible with the techniques already used by livestock farmers: "You can adopt the Patur'Ajuste technique, without refuting the relevance of rotational grazing" (T1, 09/09/2019). In this respect, this approach must be able to "integrate all breeders" (T6, 09/09/2019) and "questions all production systems; it takes the breeders where they are" (T5).

#### *A formalized training setting*

In order to disseminate its approach and thus contribute to the development of less artificial and more grazing livestock farms, SCOPELA relies on a highly formalized setting organized at two scales:

- A national network of exchanges between livestock farmers, created in 2013 (Girard and Magda, 2020). With the creation of this "Patur'Ajuste network",<sup>3</sup> the method has been enriched by the multiple experiences of livestock farmers in various pedoclimatic and socioeconomic contexts. This "confrontation of people who are in practice" (CA, 12/11/2019) made it possible to build and then expand a repertoire of experiences, as well as to generate new generic knowledge that was capitalized by and for the network (Girard and Magda, 2020).
- Individual training and support for local groups of farmers, with the support of a local facilitator. They benefit from production at the national level of the network and, in return, SCOPELA expects local groups to participate in the production of technical resources for the national scale. This commitment to "the national scale" is then seen as a means of guaranteeing a professional dynamic for the network and of creating a community around an innovative view of grazing. In order to widen the dissemination of the method, some of the local facilitators are trained in the method so that they could potentially become "transmission belts" at their local scale, as has been the case, for example, in the Morvan region, in the Pilat Regional Natural Park, and in the Haut-Languedoc Regional Natural Park.

In both cases, all the training sessions are organized along the same model. They take place at a "host farm" according to a two-stage process: classroom training and a visit to the host farm. During the classroom training, the objective of the trainers is to teach the generic knowledge of the Patur'Ajuste's method to the farmers (Girard and Magda, 2018). During the visit, they take the trainees to plots on the farm with the objective to observe the vegetation and to analyze the impact of the practices on the vegetation. Another objective is to encourage the farmers to make their own diagnosis and to think collectively about possible improvements (for example, dividing a plot into paddocks, using a plot later in the season, etc.). With these two stages, the trainers aim to link concepts presented indoors to unique situations observed in the field.

#### **The strategic training system: a trade-off between targeted learning and the local context**

##### *A diversity of individual training strategies reveals implicit training theories*

Beyond this ideal training framework, SCOPELA's training strategies and theories are both implicit and diverse when implementing a training session in a particular local environment. For example, experienced farmers are sometimes invited to become trainers during training sessions, without their

<sup>3</sup> <http://www.paturajuste.fr/>

role really being thought out in pedagogical terms. Similarly, some trainers give a role to local facilitators from an empowerment perspective, whereas others do not. If they do not explicitly set learning objectives, or do not really plan a training strategy, trainers regulate their practices through SCOPELA meetings that they organize several times a year. These exchanges are similar to feedback but do not formalize the pedagogical dimensions of their activity.

Our interviews show us that SCOPELA trainers do not share the same pragmatic theory on the learning and transmission of expertise, or the same viewpoint on the efficiency of transmission of the Patur'Ajuste method, thus giving rise to different strategic training systems. They thus combine different factors that favor learning. Some of them are related to the farmers' individual capacity, such as their appetite for abstraction or the fact that they are already engaged in changing their practices. These are the ones who most readily adhere to the "professional vision" (Goodwin, 1994) embodied in the Patur'ajuste method. Those who have tried or who wish to be accompanied to test some technical levers are more likely to extend the training towards the development of grazing practices. Other more external factors come into play in farmers' abilities to transpose concepts developed by SCOPELA to their activity. First of all, their grazing systems offer varying degrees of possibilities for experimentation, for which farmers may or may not implement principles taught in the training. The social conditions of knowledge co-construction within the training can also lead to different degrees of identification with the professional community. It thus impacts the involvement and enrollment of farmers in the training group. Finally, pedagogical and didactic conditions also play a role in the appropriation of alternative practices that emerge in this learning space. For example, the trainers agree that the pedagogical approach should make farmers want to test new practices. Linking the training contents to the different working situations of farmers and to the local characteristics is also considered to be an essential prerequisite for learning. While these elements appear to be consensual, other learning factors were mentioned individually by the trainers. These included: the trainer's attitude, his legitimacy, his ability to gain the confidence of farmers and to feel confident with himself. It would therefore be important to formalize the stages of progression of the trainees by defining progressive objectives as well as educational methods.

#### *Adapting to the local demand and to diverse target audiences*

SCOPELA members, in addition to their ideal training framework, have to prepare a specific training program to meet the local demand and specificities as well as to their heterogeneous audience. As a private service provider, SCOPELA is first contacted by a local institution (regional natural Parks, associations for the development of agricultural and rural employment, initiative centers that enhance agriculture and the rural environment, etc.). These partners, as well as constraints linked to structures and funding, then frame the topic and the actual implementation (teaching methods, facilitation, timing, etc.) of the training courses.

For SCOPELA trainers, this local coordination and adaption to the audience varies according to two main parameters. If this is the first training session in the area, the coordination is carried out upstream with the local extension agent. It consists of discussing the topic of the training and of analyzing the needs of the farmers, which can be diverse: diagnosing the vegetation, formalizing an allotment strategy, constructing a grazing calendar, thinking at the scale of the system, securing the grazing system, etc. In order to have their own interpretation of the situation, SCOPELA trainers take the time to address the farmers' expectations at the beginning of the training. The audience of this "beginner" training session is usually heterogeneous (agricultural project holder, beginners, experienced people). There are both farmers who are just discovering the Patur'Ajuste method and farmers already familiar with it. The

trainers pursue several objectives that cover both learning intentions (transmission of technical contents, sharing of professional experience and questioning it through the national network's knowledge) and more organizational targets (getting farmers to join the Patur'Ajuste network, creating a reassuring social environment that supports experimentation).

If it is an area with a collaborative and training history with SCOPELA, the farmers have more experience with the method, and the training session is co-constructed between the trainers and themselves. They choose the topics and methods of training together, in particular, the links between individual support and collective training. In this case, the local extension agent is no longer an intermediary, but part of the community. This is the case, for example, of the group of livestock farmers in the Pilat Regional Natural Park, where there is a community of practices called "Patur'en Pilat", with a clear territorial identity. With experienced farmers, the trainers are thus more likely to decipher and reformulate strategies and know-how rather than transmit technical content. The latter are then invited to experiment with a technical lever that will be discussed and shared during the following training course. This "*putting into practice*" (T1) represents an indicator of the farmers' appropriation and a potential training support, an opportunity to review the changes made to the grazing system.

Finally, the trainers work in a wide variety of territories in France, which present very different challenges in terms of vegetation use and herd feeding. The training courses must therefore be contextualized according to territorial issues in order to situate and understand "*what livestock farmers refer to when they speak*" (T1, 12/11/2019). This trainer specifies that, "*the technical content will be the same but the way of entering or answering the questions requires territorial adaptation*" (*idem*).

## **Experiential training**

### *The situated training practices of trainers*

According to the trainer's discourses, all of them note the importance of the legitimacy of a farmer's experience and his or her use of it during training. "*It is much more effective, in fact. A farmer has difficulty taking the technician's word but, on the other hand, the word of another farmer who says the same thing is much more legitimate; he accepts it more easily*" (T6, 21/11/2019). Participation is thus a key principle for the training sessions during which the experiences of farmers are a strong support to corroborate exchanged ideas.

Trainers also stated the importance of combining individual coaching with collective training, which is part of the double contract that SCOPELA advocates. It nevertheless depends on the means (time, financing) at their disposal. According to them, individual coaching allows farmers to deepen their knowledge and progress in a privileged listening environment. It is a support that helps to clarify some issues, to reassure farmers when it comes to implementing new practices, and to monitor these changes, which "*improves the effectiveness of this test*" (T1, 12/11/2019). It also improves the progressivity of learning: "*individual support is a means of pushing towards progress; it is a time when I can go further on the farms, enrich, and improve*" (CP, 10/02/2020).

In agreement with two of the trainers (T1 and T4), it is important to present the SCOP's position linking scientific and empirical knowledge without a recipe to be applied. Once this stance is presented, they seek to transfer the basics of the method, *i.e.*, "*knowledge about the processes that govern animal feeding behavior on pasture and the dynamics of vegetation*" (Girard *et al.*, 2016). To do this, they use a set of slides with theoretical and technical content. They usually present the instruments produced around the Patur'Ajuste method. For example, they use the Flora Tool, which is supposed to help the farmers to acquire a "professional vision" for plant species diagnosis (Girard, 2019).



In contrast, in this case, the other trainers begin the session by introducing the experiences of other livestock farmers (*"I introduce the theory of Pâtur'Ajuste through experiences"*, T2, 29/11/2019). This way of approaching theory through practice requires upstream work from trainers to understand the specificities of the farm hosting the training. In particular, one of the trainers seeks to encourage collective reflection on the degree of latitude or ideas for improvement in order to achieve the host farmer's objectives. According to one trainer who has constructed the farmer's grazing schedule directly with the group, it leads her to explore the specificity of the farm, which can have a negative effect on maintaining the attention of all the farmers: *"It's very unique and it requires going into the precision of each little thing, which, in a group, doesn't work well. It takes a lot of time and it's laborious"* (T5, 30/09/2019).

#### *The difficulties experienced by trainers*

Beyond the diversity of SCOPELA's trainers' practices, and in spite of their reflexivity, they all express the need to take a step back from the objectives and modalities of their training practices. Their difficulties and questions thus reveal training issues that refer to major education questions such as:

- Although the negotiation with a local extension agent can facilitate the understanding of local specificities to adapt the debate to local problems, it can, on the other hand, be a difficulty. Some local agents dictate their own instructions about the training methods, or even take the initiative to co-lead the training without having thought out the pedagogical and didactic compatibilities with the SCOPELA trainer.
- The heterogeneity of the public is difficult to manage for the trainers, especially with regard to the amount of content to be transmitted and to set up a learning curve according to the levels identified: *"It's difficult, I find, because sometimes when I take the thread of the explanation, of all the theory I know, I find it hard to get the farmers' attention"* (T6).
- The trainers all explain that the change of representation required by the Pâtur'Ajuste approach is a difficulty. "Breaking" the preconceived technical references of farmers is then a challenge for their training. *"There is a lot of work with the farmers, which also consists of unlearning, well, in any case, of comparing the old reference, the old skills, notably, with new skills"* (T1, 09/09/2019).
- The autonomous dissemination of the approach to the local groups gives rise to trainers' apprehension of a misuse of it. This apprehension concerns, in particular, some technicians and facilitators with militant roots who tend to defend some farming systems rather than others, at the risk of losing some of the farmers. There is therefore tension for SCOPELA trainers between, on the one hand, a willingness to hand over their approach to local groups and, on the other, the risk of local groups deviating from the original approach that they have created.

### **Discussion: to what extent do agroecological innovations require educational innovations?**

First of all, our results show that SCOPELA trainers find it difficult to identify what really makes farmers learn. As we have shown in our results, SCOPELA's trainers have a strong expertise on natural vegetation and pasture feeding, made up of scientific and technical knowledge, which Pastré (2006) calls a cognitive model, i.e., *"the set of knowledge available to the subject in order to understand the functioning of an object"*. However, such a cognitive model may contrast with the pragmatic knowledge of farmers. From a vocational didactic perspective (Mayen, 2015), a cognitive model should be linked

to an operative model that “allows one to understand how the system functions”. We have already begun to compare the cognitive model encapsulated in SCOPELA's expertise, with the knowledge used by farmers in their activity of grazing feeding, *i.e.*, their conceptualizations-in-action (Vergnaud, 1996). This will enable us to identify - and reduce - the cognitive barriers that prevent the appropriation of this innovative approach.

The heuristic distinction between what can be understood from what can be used by farmers in their work leads to fundamental educational questions for the agroecological transition of livestock farming systems and opens research avenues that are both pedagogical and didactic. The pedagogical point of view is related to educational methods, management of different audiences and face-to-face mediation. The didactic approach is related to the organization of content and learning activities for the development of knowledge, know-how and the progression of learning. From this perspective, it requires them to design their training systems, linking knowledge to be learned, collective exercises during training and individual on-farm experiments to ensure the progressive learning of this systemic approach. It leads us to think about how extension agents can manage the pragmatization of their expertise, *i.e.*, the situated implementation of this knowledge to better “work with” (Chrétien, 2014) the animals, the vegetation and the seasons. Even though the basics of the approach are useful for trainers, they seem to be difficult to grasp by farmers. This finding questions the relevance of transmitting the cognitive model or not during training, and how to design a “learning environment” (Brousseau, 1988) or the construction of concepts-in-act (Vergnaud, op.cit) by the learners.

Our research context then offers an opportunity to experiment with and analyze various ways of “enhancing the learning potential of work experiences” (Lainé and Mayen, 2019). It also allows us to understand how to collect and use experiences and narratives in training as examples of management principles or as a pragmatic basis for identifying more generic know-how and “operational invariants”, *i.e.*, what cognitively organizes the activity (knowledge turned into and for action) in an invariant way for a class of situations, in relation to reasoning, information gathering and goals (Vergnaud, 1996; Pastré, 2002). In this respect, the individual support that SCOPELA provides to farmers may be seen as an extension of collective training days: their aim is to support the pragmatic translation of the grazing strategies being planned or implemented by the farmer that have been discussed at the collective level. It thus focuses on the “actionability” (Schön, 1983; Argyris, 1993) of knowledge, principles and scenarios imagined during collective training sessions. The transposition of knowledge, experiences and skills into work opens up essential questions on the connections between various learning situations, between work, training and advising, which questions, in turn, the training of extension agents as trainers. Finally, the aim of transmitting an innovative approach that requires deep changes in farmers' representations raises the question of how to design training courses that make it possible to manage learning and unlearning movements, while allowing the enhancement of an innovative paradigm (Cerf *et al.*, 2011; Ollivier and Bellon, 2013) and a community of practice (Wenger, 2000; Wenger *et al.*, 2002).

Nevertheless, when gradually changing their practices to more resilient livestock systems, farmers face a dual learning temporality: the short time of learning about objects of knowledge that can be attributed to training, and the long time of development of individuals and their power to act (Rabardel, 2005; Clot, 2008). This latter temporality is partly beyond the scope of the training course and the trainers since vocational transposition of expertise to know-how must be embodied in a complex activity system (Engestrom, 1987). It leads us, and the trainers, to think differently about the heterogeneity of training audiences. The differences between the farmers in training do not only concern the production systems but, above all, their willingness to follow, adhere to and experiment with the cognitive model proposed

by this training. There is therefore a two-fold progression issue, both in terms of the content provided, but also in terms of the intentions and professional values of the trainees. This observation is in line with the analysis of Hiim (2005: 14), concluding that “[the] *experience, learning and knowledge development happen through participation in practices where intentions, concepts, and values are woven into professional vocational patterns*”. Trainers must then deal with this dual requirement of progression and progressiveness affecting both the learning of scientific and professional knowledge and the development of a commitment to new work perspectives. However, this question is, above all, a social one since it brings together the shared dimensions of the profession (values, skills, situations and types of vocational problems) (Sturring *et al.*, 2011), and corresponds to the conditions by which a group of practitioners can produce confidence, identification and reciprocal inspiration.

## Conclusion

Based on the discourse of trainers who share a common ambition of contributing to the development of less artificial livestock farming, this study highlights how an agroecological innovation is disseminated through training for farmers. Whereas they all advocate a systemic and innovative approach to grazing feeding as well as an autonomous and reflexive path for the farmer rather than a system or technique, the trainers do not have an explicit and shared pedagogical strategy, thus adapting their training to the local specificities and audiences. We have shown that the trainers’ positions and practices during collective training sessions are diverse, ranging from the transmission of principles and knowledge to learning from experience, sometimes in combination with individual coaching focused on practical application. Our findings also put forward the bottleneck of transmitting a systemic approach of livestock farming. The crucial stake of the pragmatization of such an agroecological innovation thus requires the development and experimentation of pedagogical innovations.

Being at its beginning, our research project will experiment new pedagogical modalities. On a scientific level, this collaboration with SCOPELA offers us a particularly promising research-intervention setting to understand the effects of training and support activities related to the know-how of farmers in grazing livestock systems. It will enable us to explore the ways in which stakeholders’ capacities are built when engaging in the agroecological transition and experiencing the breaches and innovations it implies in terms of working with the living world. It will also be a question of experimenting with innovative educational methods in order to transform individual experiences into resources that can be used to build the skills of others. It opens the way for contributing to research both on advice and vocational training for farmers and, more broadly, on the transformations of the work of both farmers and their advisors.

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