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Title¹: Inquiry, a framework to support the transformation of farmers' activity in agroecological transition**Author name and affiliation:****Celina Slimi ^a, Marianne Cerf ^a, Lorène Prost ^a, Magali Prost^b****^a AgroParisTech, INRAE, UMR-SADAPT, Université Paris-Saclay, Paris, France****^b Université de Bretagne Occidentale, Brest, France****Conference topic: TOPIC 3****Short abstract (200 words):**

Supporting farmers in the context of agroecological transitions is a challenge for the agricultural extension services and training. In order to contribute to support such services in facing this issue, we built a conceptual framework that allowed us to analyse how farmers' activity is transformed by agroecological transition. We then propose recommendations for services oriented towards the support of such transitions. More precisely, we highlighted five main principles of farmers' activity during an agroecological transition: the progressivity of change, the singularity of the knowledge involved, observation and experimentation, the reconfiguration of "values" and cooperation and participation in peer groups. Based on the theory of inquiry of John Dewey, we propose a conceptual framework that makes it possible to grasp all these principles together to analyse farmers' activity during their agroecological transition in a systemic way. We then highlight the need for new advisory skills so that advisors can induce and support farmers' inquiry.

1. Purpose

The purpose of this work is to build a conceptual framework for studying and supporting farmers' professional transition in the context of agroecology. The agroecological systems require a singular management that transform the way of doing, thinking and valuing the farming work (Duru et al., 2015; Coquil et al., 2017; Chizallet et al., 2020). It does not only need specific knowledge but also renew the farmers' activity itself. Thus, it seems important to build a conceptual framework that makes it possible to grasp the principles of farmers' activity renewed by agroecological transition (AET), with the broader objective of developing adequate support for farmers. The theory of inquiry (Dewey, 1938) gives some interesting key elements to identify relevant advisory skills for supporting farmers in the activity performed during an AET.

2. Design/Methodology/Approach

We first conducted an exploratory analysis of the literature on farmers' agroecological transitions at the farm scale. We selected articles emphasising one of these topics: trajectories of technical change, learning processes, farmers' motivations, situated ways of acting, factors and strategies driving farmers' choices. This enabled us to identify some principles of farmers' activity during AET and thus to complete the ones already well known regarding the agronomic and socio-economic dimensions. We also followed up some farmers and their peer group to better understand the support each participant seeks or gets through peers' exchanges (Slimi et al., 2021a, 2022). In particular, we

¹ Please rename the file with the last name of first author, a keyword and conference topic

conducted 5 interviews with each of the four farmers in a peer group in order to understand their current activity and how it could be influenced by peers. These farmers were engaged in AET through diversification of their system with livestock or no-till organic farming practices.

From both analyses, we formulated a conceptual framework based on the theory of inquiry developed by John Dewey (1938). The theory of inquiry describes the process through which habits and experience are transformed. It is an epistemic proposal that is particularly well suited to account for the intelligibility of human activities in professional situations (Thievenaz, 2014). Our framework is based on some key concepts of the inquiry process, deeply rooted in a reflection-in-action perspective (Schön, 1983). It is meant to grasp the transformation of the way of doing, thinking and valuing farmers' activity during AET.

3. Findings

Several studies have contributed to highlighting some principles of farmers' activity during AET (Lamine et al., 2009; Van Dam et al., 2010; Chantre and Cardona, 2014; Coquil et al., 2017; Dupré et al., 2017; Catalogna et al., 2018; Cristofari, 2018; Girard and Magda, 2018; Navarrete et al., 2018; Lucas et al., 2019; Toffolini et al., 2019; Chizallet et al., 2020). These studies are based on various theoretical and methodological frameworks and various disciplinary grounds (e.g., rural sociology, design ergonomics, agronomy). Across such studies, we identified five key principles to characterise farmers' activity during AET:

- **Progressivity of change:** AET is a process of progressive reorganisation of experience and in particular by going through phases of coherence and stability of the techniques and decision rules applied by the farmer (Lamine et al., 2009; Chantre and Cardona, 2014; Dupré et al., 2017)
- **Singularity of the knowledge involved:** AET relies on actionable knowledge, which is produced through interaction with the environment (social and soil-climate) and reflects variations and uncertainty arisen in the course of activity. Such knowledge is difficult to standardise (Girard and Magda, 2018; Chizallet et al., 2020).
- **Observation and experimentation:** AET requires monitoring in order to early detect potential problems and adjust the agroecosystem state (Cristofari, 2018), and experimenting in order to find solutions to problems encountered or to understand the mechanisms underlying a practice (Catalogna et al., 2018, 2022).
- **Reconfiguration of values and professional norms:** AET requires a distancing from the values and knowledge relevant to conventional agriculture in order to be able to define new standards of work satisfaction, more appropriate to sustainable agriculture (Van Dam et al., 2010; Lémery, 2011; Barbier et al., 2015; Coquil et al., 2017)
- **Cooperation and participation in peer groups:** AET relies on initiatives to mitigate the risks and uncertainties associated with a new activity (e.g., pooling of machinery resources (Lucas et al., 2019)) and meeting with peers to share information, experience and knowledge to support farming system change (Slimi et al., 2021b).

While these principles, taken one by one, are not specific to AET, their combination makes it possible to characterise the activity of farmers engaged this process. According to these principles, we can point out the need for supporting farmers according to a transformative perspective of experience and learning. Such a perspective can use the key concepts of the inquiry theory. Briefly, these concepts are:

- **Continuity of experience:** each experience borrows something from past experiences and, in some way, modifies the quality of subsequent experiences. In order to develop progressive change in a fruitful way, we have to consider the meaning of the experience and build a direction for change rooted in experiential continuity.
- **The situation as a transaction between subject and environment:** a situation is the “interweaving” of two dimensions of experience, an active dimension linked to the action of the subject on the environment and a passive dimension linked to the action of the environment on the subject. Consequently, it is necessary to consider the subject (e.g., her/his habits and norms) and her/his environment as both acting in structuring the situation. The singularity of farmers' knowledge is thus constructed through that transaction, so it prompts a particular understanding of the extent to which “the environment” affects the farmer in a specific situation.
- **Indeterminacy:** it is a characteristic of a situation creating tension and discomfort. It can be caused by inconsistencies with activity routines or what is taken for granted, lack or excess of references and resources of different natures to deal with a new phenomenon, failures to adapt the means to an end, etc. When farmers address the indeterminacy and engage in a process of inquiry, they give the new experience a meaning rooted in the situation.
- **Reciprocity of ends and means:** action is structured by the search for means, to discover new ends or to broaden the scope of the ends already envisaged. These ends guide the choice between the different possibilities of action, and are in turn influenced by the use of the chosen means. Considering reciprocity suggests not to reduce the means of action to their purely instrumental role (i.e., a mere tool for achieving present objectives). This implies to think about the singularity of farmers' knowledge as situated in a process of co-definition of means and ends of action.
- **Observation and experimentation:** they are a set of operations to look for contrast, exceptions and cases that contradict an established rule. Their role in challenging the subject's habits and beliefs makes it easier to open new points of view. The interest of this pragmatist understanding of observation and experimentation lies in its inscription in an inquiry process leading to the problematisation of the situation and the orientation of reflection-in-action.
- **Valuation activity:** it takes two forms through inquiry. First, it leads to an immediate appreciation (or depreciation) and evaluation of an object or phenomenon. It involves driving affective and intellectual components that engage the subject in an “action” of valuing, desiring, cherishing, etc. or their opposite. Second, valuation activity involves the development of propositions (rules, criteria, norms, etc.) indicating the “best” way to achieve ends and thus allowing the value of the chosen rule of action to be judged. The understanding of the re-configuration of values and norms through the prism of the activity of valuation makes it possible to put the values at the centre of the subjects' actions and no longer as an inaccessible interiority.

These key concepts are interdependent and cover most of the principles pointed above, apart from the collective dimension, which is not directly grasped by the inquiry theory. We suggested (Slimi et al., 2021b) that the collectives can be thought as a way to support the induction or the development of the inquiry process. Therefore, we argue the relevance of considering inquiry as an epistemic proposition for analysing and supporting the activity of farmers in AET.

4. Practical Implications

The issue of supporting farmers is no longer simply a question of providing missing knowledge to farmers but of facilitating farmers' activity reconfigured by agroecological transition. For Coquil et al. (2018), advisory services have to consider their intervention as one potential contribution to developing the farmer's experience and activity. Our framework based on the inquiry theory provides considerable support to achieve this. Supporting farmers' inquiry means to enable farmers in building problems and solutions situated in the way they and their environment are "tight together". In facilitating a deliberation process among farmers, an advisor has to consider what matters to farmers, through paying attention to their valuation activity and potentially questioning it to induce indeterminacy in the situation. Furthermore, the advisor has to understand how the farmers make sense to various components of their environment in relation to ends and means. For example, a cover crop can mean either binding political regulations or agronomic support to prevent soil erosion or feed for ewes.

Some other practical implication is related to the training of farmers and advisors. We support the idea of developing new skills as the "inquiry habit", proposed by Bousbaci (2020), to practise questioning habits, beliefs and experiences. It means helping farmers to get out of the status quo of the dominant agriculture by enabling advisors to recognise indeterminate situations in the activity of farmers or even to trigger indeterminacy to help them engage in an inquiry (e.g., provide access to the variability that can occur in the implementation of an innovative practice). Developing an "inquiry habit" can be useful to facilitate peers exchanges so as to be rooted in a problematic situation. For example, it can help structure the existing or missing elements of the farmer's situation in order to define what constitutes a problem or solution for her or him. This is a considerable change in the way supporting farmers is approached. It's no longer about encouraging farmers to adopt practices but about encouraging the idea of farmers' creativity of action (Joas, 1999).

5. Theoretical Implications

This work leads us to consider that an agroecological transition is not only a matter of agronomic and economic issues for the adoption of new practices. Analysing farmers' activity during an agroecological transition as an inquiry process that questions and reconfigures farmers' situations urges advisors to take into account how farmers value and evaluate the situation and the meaning given to each component of their environment. It also urges advisors to consider the environment as not only a "context" but also an active and operant element in the way the farmers experience their action according to the transaction built with their environment. Embracing the entire process by which farmers reconfigure their activity, at farm level, provide grips to apprehend farmers' barriers to engage in agroecology: the barriers are not only to be sought in "the heads of farmers" but also in a more complex relationship between farmers and their environment. This work is an invitation, through the proposed framework of inquiry, to reinforce the theoretical contributions to support the development of skills needed by farmers and those who support them in the transformation of their activity.

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