RESEARCH ARTICLE

A facilitation method to foster collective action in transitions toward sustainable agriculture—a case study

Laurent Hazard[1] · Jonathan Locqueville[1] · Frédéric Rey[2]

Abstract

Supporting farmers in their change to more sustainable practices requires dealing with the singularity of their situations. Taking advantage of local pedoclimatic and socioeconomic potential to build adapted solutions challenges the way agricultural advice is provided. Recent research on transition management shows that this requires the inclusion of change in the individual experience of farmers and the support of peer groups. The question that arises is how to articulate these individual and collective dimensions. In particular, how to ensure the groups are relevant and durable by readjusting their purposes to match the progress of the transition experienced by the farmers on their farms? We created a 5-step approach based on the concepts of "pragmatic inquiry" and "community of practice" to (1) clarify changes on their farms with the farmers, (2) map the changes, (3) record their surprises, and question (4) their collective action and (5) organisation. Its originality is to enable the reorientation of individual projects to be matched with that of the collective actions promoted by the agro-ecological transition. We tested this approach in 5 1-day workshops with 5 farmer groups who breed their own maize. Qualitative analyses of the materials produced and the workshop discussions revealed (1) the changes implemented by the farmers and what they valued, (2) the transition and the major transformations underway, (3) the way in which a collective redefines itself in this changing environment, and (4) the singular identity of each collective. Sharing these results between groups led to (1) a shift in the farmer's perception of maize from a symbol of intensive agriculture to an important element in the diversification of farming systems, and (2) the realisation that group facilitation should go beyond breeding techniques, be more systemic, and reflect on the renewal of collective action and group identity.

Keywords Agroecology · Community · Ends-in-view · Facilitation · Participatory plant breeding · Pragmatism · Social learning · Transition management

✉ Laurent Hazard
   laurent.hazard@inrae.fr

   Frédéric Rey
   frederic.rey@itab.asso.fr

[1] AGIR, Univ Toulouse, INRAE, Castanet-Tolosan, France

[2] ITAB, Paris, France

INRAE ◇ Springer

1 Introduction

The sustainable transition of agriculture requires changes in farmers' practices. Supporting this change requires transforming the way of thinking about change and reconsidering the support provided to farmers (Coquil et al. 2014; Klerkx and Begemann 2020). We need to move away from the logic that determined agricultural modernization when change implied transferring generic knowledge or one-size-fits-all technologies from researchers and engineers to farmers. This strategy based on controlling Nature and on the artificialisation of the means of agricultural production had undesirable environmental, economic and social effects (Tittonell 2014). Developing sustainable agriculture requires creating methods of support to develop sustainable practices and production systems that enhance the ecological, economic, and social potential of local contexts.

Methods to support the transition must assist existing farms to become more sustainable. In agriculture, this transition is generally conceived as a trajectory to reach a stable and satisfactory sustainable system (Brédart and Stassart 2017). Methods to support such a trajectory are based on either a prospective and normative approach or on an experiential and comprehensive one. The first approach, referred as the backcasting strategy, consists in defining a goal and then identifying the key steps to be taken and the lock-ins to be removed to reach it (Robinson et al. 2011; Duru et al. 2015; Barrett et al. 2021). Local actors can be involved in order to account for the local context and to engage the actors in the transition process. The backcasting strategy acts as a rational myth (Hatchuel and Molet 1986): it is designed in a rational way but is a myth because the ultimate goal cannot be reached. This single static vision is rapidly challenged in the course of action by the unexpected effects resulting from the volatility, uncertainty, complexity and ambiguity (VUCA) of the world (Thorén and Vendel 2019). Both

the goal of the action and means of achieving it need to be regularly revised to account for these VUCA effects. Nevertheless, working with a rational myth gets people involved. It makes it possible to build and share a collective understanding of a problematic situation. Such a backcasting strategy is certainly useful for strategic planning at the scale of a production chain or a small region (Thorén and Vendel 2019). When applied at lower organisational levels like farming systems, the increased context-dependency likely makes it rather counterproductive: the need to regularly readjust goals and means risks discrediting the promise of the rational myth in the farmers' eyes.

An experiential and comprehensive approach is more suitable to accompany farm transitions. It focuses on the changes achieved by the farmers on their own farms. Here, the concept of trajectory is used to account for these changes and the following reconfiguration of the entire farming system. Chantre and Cardona (2014) show that such a trajectory is the result of a *bricolage* and step-by-step changes that are highly contextual and path-dependent. Nevertheless, some authors are undertaking typology work to identify trajectory patterns (see for example Chantre et al. 2015; Mawois et al. 2019). The value of these trajectory patterns is then more educational than prescriptive since their reproducibility will be jeopardised by VUCA effects. Moreover, the quest for genericity conceals the hesitations, trials and errors, the serendipity and the learning that are the real processes behind the change of practice in a singular context (Brédart and Stassart 2017). This process reveals the continuity of experience as described by the pragmatist philosopher John Dewey (1980 [1916]): the actors make sense and deal with their on-going challenges by remobilising what they have learned from previous experiences, and this actual experience will modify the quality of subsequent ones. This is what Donald Schön calls "the dialogue with the situation" (Schön 1983),

i.e., a continuous enrichment or renewal of the worker's habits and experiences according to new experiences. Chizallet et al. (2018) propose a tool, "the chronicle of change", to visualise the process and help farmers conduct their transition. It allows farmers to trace changes, encourages systemic exploration, reflexivity, and sense-making to move from a reactive to a reflexive and strategic conduct of change.

The comprehensive analysis of farm transitions underlines the importance of peer groups in supporting changes made by individual farmers (Slimi et al. 2021). Peer groups are a resource for farmers to develop their own trajectory of change: a source of reassurance, risk sharing, inspiration, advice and guidance. They are also the place where the meaning given to the changes is discussed, especially through the definition of the common enterprise of the group. For instance, the quest for self-sufficiency has driven many groups of livestock farmers engaged in an agroecological transition of their farming systems (Brédart and Stassart 2017; Hazard et al. 2021). The groups are also an interface to match individual projects with societal calls for change where professional norms are renewed (i.e. the notion of a job well done, a good practice, a satisfying outcome, etc.). Finally, peer groups can also organise themselves in pressure groups to defend their interests against institutions.

In addition to their technical dimension, transition support methods must include a social dimension to deal with the creation, the work and the perpetuation of peer groups. A variety of participatory methods and tools are available for the facilitation of farmers' peer groups, but getting farmers involved and keeping them engaged in a peer group over time is not easy (Ulbrich and Pahl-Wost 2019). Darré (1984) succeeded in engaging farmers in peer groups by developing a facilitation method based on the collective resolution of their problems, accompanying the associated production of knowledge and professional norms. However, a sustainable transition differs from problem solving by its normative dimension, i.e. the need to develop sustainable practices (Loeber et al. 2007). This change in practices involves deep learning and must therefore take place in the continuity of the farmers' experience. Yet no group facilitation method explicitly addresses matching the normative dimension of transition with the individual and experiential dimension of learning. Moreover, if the sustainable transition of agriculture questions individual projects, it also questions existing peer groups and the relevance of their collective action.

The research question that arises is how to match the farmer's personal experience of change with the reconfiguration of their peer groups identity and project toward a sustainable transition? The challenge is to redefine the common enterprise while preserving individual differences, nurturing the farmer's continuity of experience while sticking with the reality and the singularity of each farmer's situation. The first pitfall consists in building a shared vision of a desirable future that loses sight of the real situation and the existing path-dependencies. It could open an avenue to ideological orientations and power grabbing by some. Social learning could also be jeopardised by a reflection focusing on reducing the gap between the planned and the achieved, with too little attention paid to how the situation changes over time (Hazard et al. 2021). The second pitfall consists in excluding marginal people with the aim of building a community whose members all think in the same way. This would result in a loss of diversity in ways of thinking that would be detrimental to collective intelligence and creativity (Wenger 2000).

In this article, we describe how to use farmers' on-going experiences of change among existing peer groups to question the relevance of these groups' existence and action. This work is based on the concept of "pragmatic inquiry" of the philosopher John Dewey (1938) and that of "community" of the sociologist Etienne Wenger and his definition of the communities of practice (Wenger 2010). After describing this conceptual framework, we present the facilitation method we designed and how we put it to the test in reflective workshops with farmers. This test was conducted in France with five farmers' groups who breed their own maize (Zea mays L.). By sharing experiences of the changes farmers are making on their farms, our approach made it possible to redefine the significance of maize in agroecological transition and to re-boost the group by revising their project and identity.

2 Materials and methods

2.1 Conceptual framework

Several authors refer to pragmatic philosophy to analyse farmers' transitions to sustainable agriculture and to account for the interaction between individual projects and collective action (Brédart and Stassart 2017; Hazard et al. 2021; Slimi et al. 2021). Pragmatism is well suited to account for such changes because it is a theory of action. It considers knowledge as "warranted assertions" or "habits" that work, i.e., a form of certainty about the effects generated by an action (Dewey 1938). People act according to these habits until 1 day, they no longer work. The knowledge no longer produces the expected effects (for example, a herbicide facing plant resistance) or its effects have become unacceptable (the herbicide is banned due to the pollution it causes). This surprise causes indeterminacy: actors know they can no longer act as they used to, but they are not sure how to act otherwise. They start what Dewey (1938) calls a 'pragmatic inquiry' aiming at restoring a way of acting that works (that produces the expected effects) and that is acceptable (whose unexpected effects do not turn out to be undesirable). This

inquiry is systemic and requires suspending judgment before acting in order to analyse the complexity of the situation and the possible solutions in light of their possible consequences (Metcalfe 2008; Lorino 2018). It takes place in a "continuity of experience" i.e., calling on the past experiences of actors and affecting their future experiences through the choice made and the action taken. The examination of the consequences of the actions to be undertaken includes an ethical dimension: through their choices, actors show what they really value. In addition to knowledge, values are also put to the test and transformed in the course of action; this is the process of valuation (Dewey 1939). In that perspective, the ends of an action have no value independently of the means: the ends are intimately linked to the means since they are hypotheses about the effects of the action. This is what Dewey calls "ends-in-view" (Dewey 1938).

Pragmatic philosophy offers a framework for action. First, it allows us to envisage a sustainable transition in a simple way: an inquiry aimed at restoring a form of determination to a situation that has become indeterminate. The process is normative since we know that we must stop our unsustainable practices but open-ended because we do not know how the solutions that we think sustainable will work out. Second, it questions the project-based management of change, i.e., setting goals and reflecting on the means to reach them. In a pragmatic view, change proceeds from a cycle of renewed improvement linking goals and means: from acting in a way that creates dissatisfaction to analysing and understanding the action situation, identifying and evaluating alternative actions, choosing, acting, further analysis, and so forth. Sustainable transition should thus take place in the continuity of the experiences of the people concerned. At the same time, this inquiry clearly benefits from being conducted collectively within a community of inquiry (Dewey

1938; Lorino 2018; Slimi et al. 2021). By developing the concept of Communities of Practice, the sociologist Etienne Wenger draws attention to the functioning of such a community and its governance to promote social learning. Social learning originates in individual experience and corresponds to the exchange of experiences between people: "What people do in their practices, what they try, and whether it works or not, all contains information that is a potential resource for someone else. Through participation in learning interactions they gain new insights and resources that lead them to change their practice, with, one hopes, improved results" (Wenger 2010). Thus, learning is "a process of realignment between socially defined competence and personal experience" (Wenger 2010). Since in sustainable transition not all solutions are equivalent, accompanying this process requires being able to collectively decide what counts, the priorities and orientations to be given. If it is clear how the community can exert a social pressure on individuals, it is also necessary to allow as often as necessary the opportunity to question the relevance of the community, its identity, and its collective enterprise (i.e. the "common" in "community") in the light of what individuals experience.

2.2 Designed method

Based on the conceptual framework presented above, we designed a facilitation method that could be used by advisors to consolidate a farmers' collective by mobilising what farmers experience on their farms. The method comprises five steps organised to fit a 1-day participatory workshop with the farmer members of a given community (Fig. 1). The first three steps are devoted to exploring the changes already underway on their farms. We called these first steps "unfolding ends-in-view" with reference to what constitutes

Fig. 1 A pragmatic approach to redesigning the project and identity of a community by exploiting the ongoing experience of change of its members in sustainable transition. It consists of 5 steps in 2 stages linking the continuity of personal experience to the community of inquiry: unveiling the ends-in-view and redesigning the community. The bubbles highlight the conceptual foundation of each step.
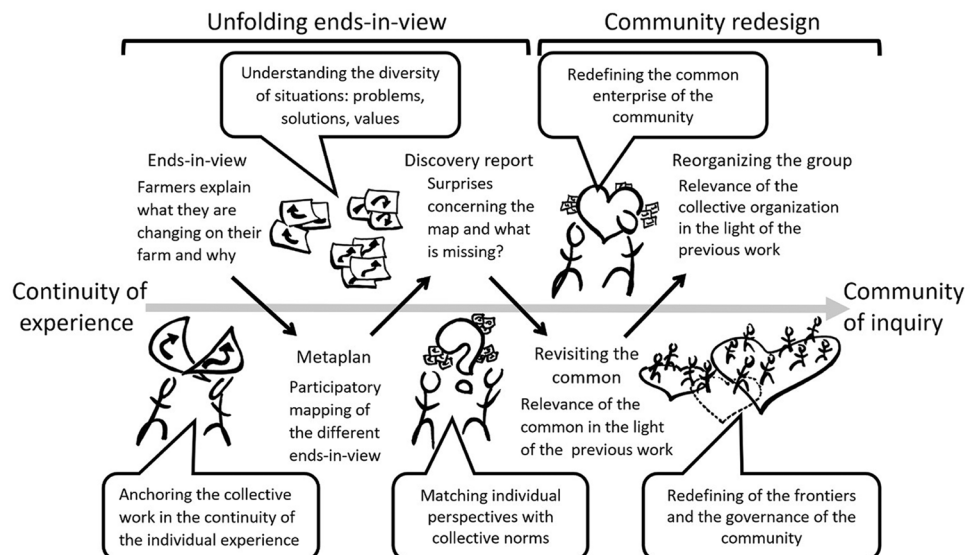
the core of pragmatic enquiry, namely the explicitation of the expectations of an action. The last two steps consist in exploring the relevance of their community in the face of these changes. We refer to these steps as the "Community redesign".

2.2.1 The "ends-in-view unfolding" phase

Expressing ends-in-view The purpose of this first sequence is to anchor subsequent collective work in the continuity of individual experience. The group is divided into groups of two to four farmers, each with a facilitator. The task is to describe what farmers are currently changing on their farms and why. They are instructed to stick to the practice and to limit digressions that distract from what is actually being done. The farmers take turns explaining the changes taking place on their farms. The whole group asks each other questions to obtain a concrete description of what is changing and what the farmer expects from the change (ends-in-view). The reflection on the objective of the change aimed at helping the farmer to place the ongoing transformations within more systemic issues. The explanations are written on a "post-it" note expressed as "means and ends of the ongoing change". The aim of this exercise is to reveal both the ongoing changes and what farmers value when they do what they do.

Metaplanning ends-in-view The facilitator collects the post-it notes, reads them aloud and checks everyone understands what is written. The post-it notes are mapped on the wall according to the Multiplan method (Schnelle and Thiersch 1979), which consists in grouping converging ideas together and distancing those that diverge. The objective is to build a shared vision of farmers' experiences on their farms. This reveals the issues, the problems, the solutions that work, and what the farmers really value.

Discovery report At the end of the metaplanning process, everyone, including the facilitator, is invited to say what surprised them in what was revealed and what they feel is still missing. This step allows everyone to appropriate the diversity revealed by the questions asked and to start a discussion that reveals and explores their own normativity in light of what is shared by the group.

2.2.2 The "community redesign" phase

Revisiting the common The "common", around which the community is organised, is revisited in the light of the "ends-in-view" map. In our case, the "common" was maize as a species, maize cultivars as populations and/or peasant selection. The discussion session began with the facilitator asking the farmers two questions about their attachment to the "common": what do you do with the common, and what does the common make you do? A table is drawn to list positive, neutral, or negative relationships between "common" and the issues revealed by the "ends-in-views" map and opportunities for improvement. This exercise aims to stimulate and engage critical thinking

Reorganizing the group A discussion is then launched to explore the role and contribution of the "community" in the light of the "end-in-view" map. The step aims to broaden the focus from the "common" to all the results of collective action. The investigation resembles that conducted on the "common". In our case, it was to re-evaluate the pros and cons of existence and governance of the "maize group".

2.3 Testing workshops

The pragmatic approach described above was tested during the "Covalience" CASDAR project. This participatory research project focused on peasant breeding of population maize. Peasant breeding is a form of decentralized participatory plant breeding organised by farmers without the involvement of genetic researchers (Gevers et al. 2019; Fenzi and Couix 2021). This project brought together researchers, technicians and five groups of farmers who practice peasant breeding of maize. The project was built around the questions raised by these groups about the relevance of continuing to grow maize in a context of agro-ecological transition, about the effectiveness of their breeding and cropping system, and about the future of their groups. Table 1 lists the farmer's "communities" i.e. groups that were formed relatively recently within associations in different geographical locations and which have different objectives.

In France, maize is a symbol of industrial agriculture. Although the farmers were working on the creation of population varieties of maize (pop-maize) as an alternative to commercial, hybrid and GMO varieties, they were also questioning the interest and place of maize in their farming systems. At the same time, they were wondering about the future of their groups, which were created to develop this breeding practice. We used our method to tackle these issues. A 1-day workshop was organized with each "community" with 5 and 8 farmers who had volunteered to take part. In Table 1, the letters (A to E) heading the columns indicate the "community" to which the farmers belong and the code number of the farmer in each group is given in the left-hand column. The workshops were facilitated by the authors of this article, i.e. the researcher, the student, and the engineer who designed the method. In each case, the authors recruited group facilitators to assist them in the implementation of the method.

The objective of testing the method was to see if and how it was possible to challenge a collective based on the

Table 1 Description of the workshop participants. The participants, numbering from 5 to 8 depending on the workshops, are farmers who belong to the "maize group" created between 2007 and 2018 within each of the 5 associations that differ in their main topic. In the study, the farmers were identified by a number and the letter of their maize group (i.e. "community"). A brief description of their production systems is provided to characterise those who took part in the workshops.

	Community				
	A	B	C	D	E
Topic of the association	Development of peasant farming in the Loire department	Development of peasant farming in the central region	Development of organic farming in the Dordogne department	Preservation, promotion and development of cultivated biodiversity in Poitou-Charentes	Experimentation and implementation of new practices to combine environmental, economic and social objectives in the Loire-Atlantique departement
Creation of the maize group	2007	2018	2001	2004	2011
Date and location of the workshop	24 Jan. 2019 Sainte-Foy-L'Argentière	7 Feb. 2019 Châteauroux	26 Nov. 2020 Perigueux	15 Feb. 2019 Chabanais	20 Dec. 2018 Vieillevigne
Farmer 1	100 ha, organic farming, 2500 laying hens, 20 dairy cows	65 ha, 20 dairy cows, goats, mixed-farming system	206 ha, organic farming, no-till, 65 dairy cows, 30 beef cows	115 ha, organic farming, 70 dairy cows	110 ha, organic farming, 70 dairy cows
Farmer 2	75 ha, organic farming, no-till, 45 dairy cows	170 ha, organic farming, 75 beef cows, mixed-farming	120 ha, organic farming, arable farming	350 ha, organic farming, arable farming	94 ha, organic farming, 50 dairy cows
Farmer 3	55 ha, organic farming, 30 dairy cows	140 ha, 65 dairy cows	55 ha, organic farming, 20 beef cows, mixed farming and market gardening	68 ha, organic farming, 40 dairy cows, mixed farming	90 ha, organic farming, 70 dairy cows, mill
Farmer 4	13 ha, poultry, bee keeping	120 ha, 80 sows and 35 dairy cows	20 ha, organic farming, poultry, mixed farming, market gardening	92 ha, organic farming, arable farming	130 ha, organic farming, 90 dairy cows, winegrowing
Farmer 5	85 ha, organic farming, 200 laying hens, 40 dairy cows, processing	135 ha, arable farming	70 ha, organic farming, goats, walnuts, mixed farming, bread making	90 ha, organic farming, 30 dairy cows, 40 beef cows	95 ha, organic farming, 80 dairy cows
Farmer 6	70 ha, organic farming, 32 dairy cows, direct sales	65 ha, 45 dairy cows	223 ha, organic farming, 120 beef cows, mixed farming		104 ha, organic farming, 48 dairy cows
Farmer 7	36 ha, organic farming, 25 dairy cows	10 ha, organic farming, goats	12 ha, organic farming, 16 beef cows, ducks, mixed farming		
Farmer 8			20 ha, organic farming, goats, mixed farming, mill		

exploration of the changes experienced by its members. Our action and analysis was therefore limited to what happened in the 1-day workshops. Although the method led workshop participants to question their collective action and the relevance of their community, its real impact on their transformation was never an objective of our study. The small number of farmers who took part in the workshops made it impossible to envisage transformative action without jeopardising the democratic governance of the communities.

2.4 Analysis

All the materials produced in the workshops (post-it notes, diagrams on flip charts) were collected. The discussions held during the workshops were recorded and transcribed. We analysed the materials produced in the workshops during each of the 5 stages of the method implemented in order to link the synthesis work done during each workshop (workshop analysis, stage 1 and stage 2). In addition, we conducted a thematic analysis of the transcripts (Braun and Clarke 2006). In this inductive approach, there were no prescribed topics, the themes were inferred from the discourse analysis. The data from the transcripts were coded by classifying them in a hierarchy of sub-themes and themes. QSR NVivo® (version 12) qualitative data analysis software was used to analyse the data and perform the coding. The main themes that emerged are listed in the left-hand column in Table 2. The reproducibility of the coding between authors was tested by coding the same transcript independently. Reproducibility was high. Based on this qualitative analysis, we produced an interpretation of the main changes underway among the farmers that challenge collective action. The main themes are in italics in the text in section 3.2 (thematic analysis, stage 1). We also conducted a semi-quantitative analysis of the similarities and differences between the five communities in order to describe their specific identities (thematic analysis, stage 2).The recurrence rate of the themes was calculated for each of the workshops as the number of coded sequences for a given theme out of the total number of coded sequences. Table 2 shows the recurrence of the themes for each workshop/community. Due to the workshop workflow, this recurrence reflects the importance given to a topic by the way the workshops were conducted. Indeed, the sub-group work, the feedback sessions, the summaries, the discovery report, the questions concerning the "common" and "communities" were all opportunities to redirect the discussion towards the topics the participants cared about. The qualitative analysis of the transcripts of the discussions confirmed this interpretation, as no important and even consensual theme was covered in only one or a few specific moments of discussion.

As the workshops were part of a participatory research project, all the results and interpretations were presented and discussed with the workshop participants during the meetings of the Covalience Project. The entire study presented in this article was validated during the final seminar of the Covalience project (June 8 and 9, 2021).

For ease of reading, we present the results in 4 parts organised as follows: unfolding farmers' ends-in-view (workshop analysis, stage 1), on-going changes that challenge collective action (thematic analysis, stage 1), redesigning community (workshop analysis, stage 2), and collective identities (thematic analysis, stage 2).

Table 2 Coded themes and their recurrence rate in percentage calculated for each of the workshops as the number of coded sequences for a theme out of the total number of coded sequences.

Coded themes	Community				
	A	B	C	D	E
Maize	14.2	12.0	7.1	15.6	13.8
Breeding techniques	0.0	0.0	5.2	0.0	0.0
Community	12.1	4.7	7.8	10.4	14.4
Feed self-sufficiency	3.8	2.1	1.5	2.9	5.2
Work	4.1	4.2	11.6	4.0	9.8
Climate change	21.8	35.1	21.6	14.4	5.2
Conservation agriculture	11.7	6.3	7.5	4.6	0.0
Political project	4.6	2.1	3.7	18.4	2.9
Economy	10.9	7.9	18.7	1.2	6.9
Difficulty-faced changing	0.8	0.5	3.7	8.1	0.0
Social agriculture	4.6	5.2	2.6	9.8	22.4
Environmental impact	3.8	2.1	4.9	7.5	13.2
De-intensification	5.4	14.1	3.7	2.9	6.3
Outcrossing	2.1	3.7	0.4	0.3	0.0

3 Results and discussion

Adopting a pragmatic approach helps understand the "dialogue with the situation" (Schön 1983) and to support it collectively. The exploration and sharing of individual experiences makes it possible to propose the adjustments needed to maintain collective action. Farmer D1 summarized the exercise as follows: "It confirmed what we do, the consequences of our action... It fleshed out our perception of the consequences. It's really vast, we start with maize seeds, and it encompasses a lot of things about practices, about society... It's impressive".

The first stage of the workshops roots the collective work in the farmers' experiences by exploring their ends-in-view of the transformation of their farm. It reveals the problematic situations faced by the farmers on their farms, the changes already made, their difficulties and how they solve them. More than just shedding light on problem solving, it reveals farmers' projects and what they value. The transversal

INRAE ∅ Springer

thematic analysis of this first stage enables a better understanding of the major changes that challenge collective action. The second stage of the workshops reveals how the common enterprise is redefined in the light of these changes, as well as the expectations of the collective; embarking on new meanings for old forms of common objects. The transversal thematic analysis shows that the singularity of the situations contributes to the construction of the identity of the collectives, even though they work on the same object.

3.1 Unfolding farmers' ends-in-view (workshop analysis, stage 1)

The farmers showed no reluctance to take part in the exercise. Although they had come together for a project on peasant breeding of maize populations, the farmers easily explained the changes underway on their farm (Table 3). They described these changes in small groups. By asking them to express these changes in the form of ends-in-view, i.e. to make the objectives of the implemented changes explicit, obliges them to engage in what Wenger (1998) calls "a negotiation of meaning" with the members of the subgroup. This provides an account of what works and what does not and reveals what they value. For instance, after explaining all the technical changes made on his farm, C8 said "my concern today in relation to optimisation is the need to work less. Because if there's one big problem here, it's exhaustion.../... there are 10 of us working on the farm, and I spend too much time in the operational field... Because the technique, I would say that we agree about today…/…" and then he explained the way he makes his technical choices in great detail, until C7 interrupted him and a dialogue began:

> C7: *But you skip from time management to technical questions of soil cultivation. You described the soul of your system, which is very well described.../... you have optimized it. You have a big problem of time and you ask questions about working techniques which you will adapt to the needs of the land: if you have to use a harrow, you do so.../... the question is: what means do you use to optimise the system?*
> C8: *Technically the means… today there is no need for much investment.../...*
> C7: *Today you don't have any plans to buy any special equipment?*
> C8: *Just one more tractor... Today, technically, I can manage. The working hours… in my opinion, we have to be able to do the technical work in a shorter period of time.*
> C7: *So that means that other people could do it…*
> C8: Exactly! Today I have a brother who is coming back. In fact, that's why I marked "delegate" [he had

written "delegate" on the Post-it note) .../... because I'm aiming to achieve well-being for all the workers, including myself. I want everyone to feel good.
> C7: *and a bit relaxed about working hours…*

Such exchanges helped them to write their ends-in-view, i.e. the action undertaken and the goal behind the action, on one or more post-it notes. Only one of the farmers hesitated to do the exercise because he was dealing with employee problems on his farm and thought that the human aspects did not match the goal of the exercise (C7, Table 3).

These ends-in-view were not trivial: four farmers out of 34 clearly stated change was indispensable to save their farm from bankruptcy. For three farmers, the change was radical: abandoning livestock farming (A4), diversifying production (A1, A2), and changing their way of marketing, particularly changing to direct sales (A1, A2). For E2, a young dairy farmer, it was a question of intensifying and producing more milk to pay off his bank loans.

The other farmers described their changes as being their own choice. The first reason given was the quest for autonomy, which led them to reduce the size of their herd and to adopt an all-grass farming system (A5, A6, B4, B7, C4, D3, E1, E5). For three farmers, taking advantage of grass to feed their cattle was made possible by modifying the genetics of their herd through crossbreeding (A3, B3, D1) a technique described by Magne and Quénon (2021). Five farmers changed from producing animal feed to producing human food (C2, C3, D2, E3, E6). C3 purchased a mill to produce flour on his farm. Four farmers wanted to reduce their workload to have more free time (C7, E1, E3, E5). They stopped time-consuming activities such as force-feeding ducks (C7), milking in winter, or growing maize (E5), or direct sales like C6 once he found an intermediary who pays him well for his production. Others hired new workers on the farm (E1, E3). The wish to create employment led some farmers to restructure their land to enable market gardeners to set themselves up on their livestock farms (A2, E4, E7).

Discussing the farmers' ends-in-view clearly revealed the farmers' values through what they choose as goals and means of their actions. This valuation was debated in the subgroups and during the construction of the metaplan. Some choices clashed with the values of the other participants, for example, with those of farmer C6 who was expanding irrigation whereas the goal of the group was to develop drought-tolerant maize populations. This was also the case of farmer E2 who was increasing production to pay off his bank loans. However, the members of his community offered to help him analyse and reduce his production costs.

Mapping the ends-in-view via the metaplan led to eight issues (Table 4). These eight issues were identified during the workshops. A more in-depth thematic analysis of the

Table 3 Ongoing farmer-led changes on their farms.

Farmer	Community				
	A	B	C	D	E
1	Reducing the dairy cow herd with diversification into egg production to improve income	Trying summer fodder to cope with summer drought	Changing calving dates to adapt to summer drought	Crossbreeding in dairy cows to create an adaptable animal population allowing to face hazards	Reducing the number of dairy cows to become more self-sufficient and partnering with his employee
2	Restructuring his land to enable market gardeners to establish themselves	Reducing the number of cows and increasing grazing to improve income	Starting processing of products for human consumption	Joining a cooperative that targets human food and adding a sheep flock to make use of intercrops	Increasing milk production to pay off his bank loan
3	Crossbreeding cows and growing new crops to cope with the summer drought	Crossbreeding to obtain cows that are more efficient on pasture and switch to all grass	Milling maize into flour for human food	Reducing the number of cows and area under maize to favour grazing and to protect the soil	Hiring an employee and stop winter milking to have more free time, develop cereals for human consumption
4	Replacing dairy cows with poultry for direct sale to improve income	Reducing crop treatments and increasing grazing by cows to reduce production costs	Reducing the area under cereals and returning to grassland to limit impacts on the environment	Reducing ploughing and returning to milking twice a day at the request of the future owners of the farm	Restructuring the land and setting up a market gardener on the farm
5	Reducing milk production from 7,500 to 5,000 litres per lactation to increase system resilience	Testing spring crops and lengthening the rotation to adapt to summer drought	Stopping raising goats and developing fruit trees, ploughing less and limiting mechanisation	Growing earlier varieties to avoid summer drought, conducting trials of summer meslin	Stopping winter milking and reducing maize to have more free time and reduce the use of fossil fuel
6	Switching to all-grass farming to reduce production costs	Testing various forage species to increase forage autonomy to cope with drought	Stopping direct sales and irrigating maize to simplify the work		Developing a cheese factory on the farm and feeding the dairy cows with grass to increase income
7	Stopping ploughing to restore soil fertility	Reducing production of goat milk from 900 to 650l per lactation to reduce production costs	Managing human problems on the farm, stopping force-feeding the ducks to free up time		Restructuring the land to increase grazing and free up space to set up another farmer
8			Maintaining farm autonomy by switching to direct seeding and no-till		

Table 4 Themes that emerged from mapping the meta-plan for each of the workshops with each of the farming communities.

Themes of the meta-plan	Community				
	A	B	C	D	E
Autonomy	Economic, decision-making and forage autonomy	Farm autonomy by developing maize populations	Self-sufficiency in seed and animal feed, finish animals	Forage self-sufficiency	
Resilience to climate change	Innovative crops, irrigation	Innovative crops, complex forage mixtures, flexibility and ease of crop management	Creating resilience through genetic diversity, innovative crops	Innovative crops, flexibility	
Conservation agriculture	No-till, reducing maize crop	No-till	No-till	No-till	
Work	Improving working conditions		Limiting working hours	Freeing up time	Freeing up time
Economy	Marketing organic milk	Creating of a value chain		Creating added value, collective organization for value-adding in organic farming, diversification	Increasing production
De-intensification	All-grass project and reduction of milk production (7,000l per dairy cow lactation)				Increasing grazing, reducing the number of animals
Transition	Axiological coherence of projects, feeding people				Reducing fossil fuel consumption, feeding people
Social agriculture	Farm succession	Promoting exchanges between farmers, farm succession and installation	Farm succession, encourage sharing and experimentation		Helping farmers set up, creating jobs on farms

contents of the discussions is provided in the following section. Not all emerged in all the workshops, suggesting differences between the communities and their environment, which will be discussed in the last section. The 'discovery report' session offered another opportunity to bring out questions that are not at the heart of the changes being made (Table 5). The nature of the surprises is diverse, but it essentially question values (the attachment to social agriculture, reduction of work and quality of life at work, reduction of energy, abandonment of husbandry) and the fact that economic rationality is finally so little present. At the end of the discovery report, participants had the opportunity to complete the metaplans with new post-it notes, but none did.

3.2 On-going changes that challenge collective action (thematic analysis, stage 1)

Although the meta-plan carried out in situ in each workshop on the basis of post-it notes allowed us to identify up to 8 themes. The qualitative thematic analysis carried out ex post on all the workshops allowed us to identify and detail 6 major changes that are transforming the collectives. Transition is the result of changes in the environment that produce problematic situations, as in the case of climate change, but also in mentalities that transform individual judgments about what is done and generates new projects. This analysis shows above all that farmers are in transition. In the unveiling and discussion of farmers' ends-in-view, we discerned the three dimensions of the agroecological transition pointed out by Coquil et al. (2018): the technical dimension with, for example, the restoration of soil fertility or the construction of more resilient farming systems, the ethical dimension with the desire for social justice, and the political dimension with the desire for autonomy and sovereignty over their genetic resources. The normative dimension of the agroecological transition was present in the discussion about the relevance,

the relocation, and the re-design of livestock farming, the desire to dedicate all cereals to human consumption, the reduction in the use of non-renewable resources, etc. The indeterminate dimension was also present in the discussions that arose from successes or failures and backtracking, for example concerning conservation agriculture, organic farming, processing or direct sales. Indeterminacy exists and is huge for these professionals so there is no need to create it in order to get them to change, as Slimi (2022) proposes, following Hutter and Farías (2017). As suggested by these authors, it does create the condition for newness. The idea is to build modes of transition management that are anchored in the continuity of farmers' experiences and aim to lead them to engage in a pragmatic inquiry to overcome this indeterminacy.

3.2.1 Climate change is transforming individual and collective strategies

For farmers, *climate change* meant summer droughts, heatwaves, but also flooding of fields in spring. Farmers are trying to escape summer droughts by changing calving dates, choosing earlier maize varieties, planting new crops and adopting new practices: trees planted to provide shade and additional fodder, using species and mixtures that are more resistant to drought (fescue, chicory, red clover, complex forage mixtures, etc.). Among the quests for solutions, irrigation was controversial. In the A community, the participants who use hillside reservoirs and irrigate their crops declared that "irrigation is not bad, if it is well done" (A2). In the other groups, irrigation is not acceptable, and the farmers were testing summer crops as an alternative to corn (forage sorghum, Aleppo sorghum, meslin, moha, miscanthus, millet, etc.).

In this context, *conservation agriculture* (Dumanski et al. 2006) is seen as a way to increase soil water retention

Table 5 Surprises described by the participants during the « discovery report » exercise in the five workshops conducted with each of the farming communities.

Community	Surprises
A	Setting up a market gardener on the farm
	Thinking about stopping livestock farming in the region
	Reducing work by changing production or hiring workers
	Planting trees while it is still possible
	Nobody questioned the profitability of the farms
B	None
C	Quality and food were frequently mentioned
	No mention of « economy » and « social », and the word « yield » was not used
	Quality of life not very present
	No political aspect
	The word « diversity » was not used
D	Nothing about debt, return on investment, energy
	Nobody mentioned job satisfaction
E	Talking about energy reduction or quality of life at work
	Need to better focus on the human aspect: how to welcome and support people

and reduce erosion. Innovative practices were discussed such as spreading hedge clippings with manure to increase soil organic matter. In organic farming, farmers acknowledged that they replaced chemical inputs by diesel to work the soil and get rid of weeds. However, some organic farmers were concerned about the functioning of their soil "I farm organically, and we no longer have a safety net, we must preserve the soil" (A7). They referred to a model of organic conservation agriculture (French acronym ABC for *Agriculture Biologique de Conservation*) that needs more experimentation before it can be expanded.

In their efforts to adapt to *climate change*, farmers have little opportunity to apply their experience and practical wisdom: as pointed out by Rodriguez et al. (2014), they adapt in real time. Faced with the urgency of the situations they have to face, they use opportunistic approaches: for example, a few farmers justified their self-production of seeds by the need to keep the possibility of resowing at less cost after damage. The flexibility of the system and the opportunism of the farmer favour adaptation (Rodriguez et al. 2011). Farmers feel that "there is no longer such a thing as a normal year" (D2) and that it will no longer be possible to "set up (their farming system) once and for all" (D2, C8) other than by ensuring its flexibility. Opportunism and flexibility have become desirable traits of resilience (Rodriguez et al. 2011).

The quest for *feed self-sufficiency*, which has motivated many groups of breeders (Brédart and Stassart 2017; Hazard et al. 2021), is no longer a feasible objective for farmers facing climate change. The desire to maximize the share of animal feed produced on the farm and to start cultivating the protein crops they lack has clearly been a strong argument for change in recent years. It is still strong enough to become a driving force for building resilience at the collective level. This is the case in the A and C communities where a form of community resilience (Revilla et al. 2018) to *climate change* has emerged to rebuild autonomy at the territorial scale: "It's almost more fulfilling to lose a little bit of autonomy but to gain social linkage, solidarity, sharing" (A2). In this context, the transactions concern seeds, fodder, and the boarding of animals. They make it possible to promote crop-livestock complementarities by exchanging straw or alfalfa for manure (A1, D2), for cereal farmers, by having sheep graze their fields after harvest or having a shepherd set up on the farm (B3, D2).

3.2.2 De-intensification is not taboo

Many of the farmers were willing to admit they were de-intensifying their farming system. *De-intensification* is an adaptive response to *climate change* and to the drop in the sales price of agricultural products, and is based on reducing crop or animal production. Some were reducing mechanisation, consolidating land to increase grazing, reducing or

no longer including corn in the feed ration, particularly to stop using correctors, stopping growing cereals in favour of grassland, and switching to an all-grass system through barn drying. Concerning livestock, some farmers were reducing the stocking rate per hectare by reducing the size of the herd and/or the production per animal by reducing their purchase of feed: "In 2000, I had 80 cows, now I have 40 and I still earn my living…/… I used to spend 30,000 euros on feed, now I only spend 3,000 euros" (D3). They reduce the frequency or duration of milking and/or change the genetics of the herd. *Crossbreeding* helps reduce animal production (Magne and Quénon 2021): it alleviates the reproductive problems of Holsteins, allows better valorisation of veal calves, and gives cows more aptitude for grazing "to fatten outside.../...and to eat woody plants" (C4).

3.2.3 Performance refers to the financial margin rather than to the production volume

Economy "refers more to the margin than the volume, and so all our thinking is oriented towards that. In the longer term, we may even consider reducing the surface area" (C5). *De-intensification* helps maximise margins by reducing production costs. Grazing and farm seeds are seen as ways to reduce production costs. Nevertheless, discussions were animated around the cost of labour not being taken into account in the evaluation of these practices. Increasing the added value of products is another strategy to increase income. The discussions revealed the difficulty of 'selling' the quality of products given the proliferation of labels whose requirements and visibility are not linked. A facilitator in the A community hopes that the '*Haute Valeur Environnementale*' label "will be more visible to the consumer than a demanding label such as '*Biocohérence*', about which consumers know nothing". The organic farming label remains popular and allows many farmers to sell their products at a higher price.

According to the farmers, direct sales allow a considerable increase in margins. Moreover, selling at the farm gate allows diversification of sales because "people who come (to buy eggs) say: "we would like a trailer of manure".../... "I need two round bales of hay for my pony"" (A1). Finally, processing adds value to the product: making bread, yoghurt, cheese, semolina and flour with an on-farm processing plant or a mill.

3.2.4 Ethics is becoming a driving force for change

Marketing in short circuits builds a relationship with the consumer that "is hyper-valuing .../... with customers who say: "your eggs are very good"" (A5). It can also be a source of guilt and a driver of change: "Today we are starting to have more and more contact with consumers through direct sales, and I say to myself, our animals that are not fattened

enough, we sell them, but where do they go? To feed children in school canteens… It's going to be chopped up and it's going to feed the kids. Today, this makes us feel very uncomfortable" (E3). The "ends-in-view" method we implemented reveals that beyond *economy*, the changes undertaken by farmers may be inspired by ethical or even emotional considerations when it comes to implementing "the vision I have of small-scale agriculture, of a mixed crop-livestock farm in the Dordogne, like the one I was raised on as a child. Where ducks played a festive role" (C4) or to realize "my father's dream, it was a kid's dream, today I have my barn drying unit, I am 26 years old, I am proud of it" (A5). New attachments are emerging in practice: peasant breeding leads farmers to "get involved in the life of their varieties.../... There is a relationship with the plant that is not at all the same as with a hybrid. Yes, it recreates a link with the earth, with the plant, with time, with the long term.../... in addition I gave the variety I created my daughter's name, I wouldn't want to lose this seed, so I take more care of it" (C7).

3.2.5 Political projects underlie changes

For C1 "Processing (agricultural goods), it's a job, but producing milk, meat, eggs, it's also a job, and we should be able to earn our living from it". "The price of agricultural products remains too low in a society that does not accord these products their real value, the value of the work time it requires to be of good quality and respectful of the environment and respectful of the person who does the work" (C7). It is *political projects* which, in several cases, underlie the ends-in-view to defend organic farming: "I still want to demonstrate that organic is productive" (A2), to increase my autonomy, to create alternatives to hybrids and GMOs to recover 'seed sovereignty'", "participatory breeding is a political act, it means reappropriating the ancestral work of the farmer to select, to keep his own seed" (E4), and above all to promote *social agriculture* "that creates employment" (C7). Creating jobs has become a performance criterion: "for 95 ha, we have 6 employees" (E2), "I have a small farm compared to the neighbours who have 110 cows but I give more people work than they do" (D3). Most of the farmers feel the need to encourage people to become farmers and to be able to transmit a capital and a vision to young people: "to be able to say perhaps my farm can be passed on in 30 years, when I retire" (E5); "to find a buyer who has the same ideas as me" (D4). However, many farms are not taken over which results in existing farms getting bigger: "what should we do with this land, should we let farms get bigger, or should we think about how we could create jobs around us?" (E5). Several farmers are setting up market gardeners on their land (A2, E4). Recruiting, helping farmers set up raises questions about the difficulty of working and living together, especially since "today farmers are not trained to

accompany people" (E1). The *community* should therefore make it possible to train "young people who want to set up. We have to show them all about it and the consequences it has" (D1).

The social aspect of *social agriculture* seems to take precedence over the environmental aspect in the search for sustainable agriculture. In these communities, reducing *environmental impacts* means converting to organic farming. Some, however, echo a societal demand for less animal husbandry and meat consumption: "we shouldn't eat meat anymore.../...there is no point in increasing the livestock population.../...we need to reduce it" (B2). Reducing the use of fossil fuel was only mentioned by two farmers as an environmental objective (C7, E5). Finally, animal welfare was barely mentioned. The fact that cows are made to eat grass, to be outside, etc. are rather a justification to support the *de-intensification* of farming systems. Only one farmer expressed the difficulty he has with slaughtering animals: "there is one thing I can't manage, it's the end of the animals' lives.../... Because somehow you end up loving your animals" (D4).

3.2.6 Improving the quality of life means reducing work time

Only one farmer, D3, mentioned the pleasure he gets from his work: "I like planting trees, maintaining hedges.../... it makes me feel good, I feel really peaceful. My wife can see that". Above all, the work is described as "exhausting", repetitive tasks that bring little profit. Farmers want to reduce their work time by abandoning time-consuming tasks such as processing, milking in winter, peasant breeding, etc., so that they can have time to do the rest of their work properly, discuss with their peers, spend more time with their family and enjoy leisure activities. Sometimes the quest is simply to find time to communicate between workers on the farm: "this morning when we saw each other at milking, she told me "we absolutely have to sit down, take the time, discuss it"" (E3). As Dockès et al. (2019) note, work is a widely shared concern among farmers, but addressing this issue is a challenge. In the five collectives studied, no action was taken to address this topic, in contrast to issues of autonomy, transmission, and setting up.

3.3 Redesigning community (workshop analysis, stage 2)

The last two steps of the workshops consisted in asking questions about the collective enterprise (the common) and the collective itself (the community) in light of the analysis of the ends-in-view. We conducted this exercise in a very simple way by referring to the themes that emerged in the meta-plan and asking about the value of the maize, the work

done on maize, and the "collective" and its role. The results account for all the discussions involving the "common" or the "community".

In her work, Slimi (2022) shows that farmers in transition revise the meaning of the objects they work with. This is what happened in the second stage of the workshops. The maize around which the five communities organise themselves was redefined: from being the symbol of intensive agriculture, it became an important element of diversification and de-intensification of systems. The revision of meaning also applied to the collective, which was enriched with new dimensions to support social learning.

3.3.1 The versatility of maize is appreciated in the transition to biodiversity-based agriculture

The main question the workshops had to answer was the relevance of *maize* in farming systems. Far from denying its relevance, the "ends-in-view" method revealed the advantage of maize as a resource for the diversification of farming systems. E5, who had originally announced that he was going to stop growing maize, said at the end of the workshop: "On the farm, it is clear that we are not going to stop growing maize. It is obvious now, it (the work done during the workshop) really allowed me to do this work".

In Western countries, maize is associated with the over-simplification of farming systems and as the cause of environmental problems. Rotation diversification and mixed cropping are ways to diversify intensive maize-based systems (Roesch-McNally et al. 2018). However, the work accomplished in the workshops underlined the versatility of maize which, in fact, was able to help diversify farming systems. In India, its versatility has already made maize popular as a way to diversify farming systems and/or increase their resilience (Dass et al. 2012). New outlets are cited for example, sales for gluten-free human food. In animal husbandry, maize makes it possible to secure stocks, to better manage grazing or to prepare animals for reproduction (flushing). In large quantities in a ration, maize is difficult and costly to correct with nitrogenous concentrates, but it is a very handy corrector for the excess nitrogen in a grass-based diet rich in legumes. It can be used as "slow-digesting energy" (E6) when only the cobs are used to produce concentrate. In that case, most plant biomass is returned to the soil, thereby promoting soil conservation.

Maize fits the rotation as an excellent spring/summer crop: "Grassland works well before maize. In working the soil, in restoring organic matter, potash... and conversely, with its root system, it helps the following crop to establish very well" (E5). Maize is easy to grow on hydromorphic soils and means "the manure produced in the second half of winter can be used" (A2). However, its establishment after grassland requires cleaning by ploughing or using herbicides, which is problematic for many farmers who are interested in organic conservation agriculture. A2 and D4 grow maize in the organic and no-till farming mode by inter-cropping a summer rotational crop between the grassland and the maize crop.

Maize remains "the crop that works best in organic farming.../..., it grows at a time of year when the temperature causes mineralisation of nitrogen…/… It is one of the plants with the highest rate of photosynthesis" (A2). Even if it requires water, its efficiency is considered to be exceptional: "it consumes, but look what it gives back" (C7). Nevertheless, the farmers questioned the relevance of comparing the efficiency of wheat, which consumes water when it is available, with that of maize, which consumes water at a period of the year when water is scarce.

Finally, producing "pop-maize" seed is cheaper than buying commercial hybrid seed. Moreover, pop maize is very well valued as corn-on-the-cob for human consumption. Currently, there is a lot of discussion about pop-maize vs. hybrids. Farmers acknowledged that comparisons are difficult because pop-maize grows later than hybrids and is often grown on poorer land. Nevertheless, the farmers in the A community consider pop-maize produces 20–30% less grain than hybrids. On the other hand, some farmers claim that pop-maize is of better nutritional quality, thereby increasing the growth and improving the health of their animals. They would like scientific studies to be carried out to check this hypothesis.

3.3.2 The community must handle other dimensions than the biotechnical one

The communities are clearly a source of reassurance and support for change. Starting to produce one's own seeds or going organic is frightening: "I was a bit scared myself. It wasn't easy" (A6), as reported by Bouttes et al. (2018) in a group of farmers who were switching to organic farming. The collective organises the production of knowledge through experimentation and the exchange of experiences. All the communities studied here organise training courses to help with the change. They organise trips that are also opportunities to learn, for example, how to deal with climate change, C6 said they wanted to "be inspired by what Portugal is doing today to design our systems for tomorrow". The collective appears to be a resource for sharing experiences and materials, and for creating exchanges of seeds or labour. For some, the collective is also an instrument to lobby policy makers and obtain subsidies.

Ensuring the long-term participation of farmer members in their community life is problematic. The problem of long-term participation is widespread among farmers' groups (Ulbrich and Pahl-Wost 2019). The main reason given by the farmers in our study was that, given the range

of problems they have to face, using maize as a "common" is too restrictive. They also pointed out that many participants came specifically to acquire technical skills and left the group once they had acquired them. At the end of the workshops, developing global approaches appeared to be a necessity both to better deal with the diversity of problems and to revive discussion about the values on which the collective was based. The facilitator of the E community noted that the only group in their association that does not have a technical input is the "women's" group. This group, which brings together women farmers, has a global approach that gives coherence to their learning: "they go on to do training in everything.../... We (the maize group) don't have any links with the other activities (of the mother association)" (facilitator, E community). Participation in the community is likely to be promoted, as the focus was not only on the technique, as mentioned by C3: "we can always believe that the technique will solve our problems, and to some extent, so it does .../... but still, I think that all (these) questions can be thought about in a different way than only the technique". In fact, C3 left the C community because he thought that its focus was too technical. However, it is very clear that technique is still considered by the majority of facilitators and farmers, as the dimension to be developed to ensure participation in the community. The shift from a technocentric to an anthropocentric vision is therefore not complete in these collectives, meaning the use of the term "community" is undoubtedly inaccurate.

3.4 Collective identities (thematic analysis, stage 2)

The thematic semi-quantitative analysis based on the discussions that took place in all the workshops allows us to characterise the different identities of the communities. The originality of this work is its starting point, the farmers' ends-in-view mean that identity can be established more based on facts that on the community members' discourse. In terms of facilitation, it means working on the group's identity on an ethical basis rather than on an ideological construction. Ethics refers to the judgment that governs the choices made in action (Fabre 2014). It has its roots in the dilemmas that farmers must resolve on a daily basis, for instance ploughing or spraying herbicides to control weeds in organic conservation agriculture. The benefit would be to align actions with words thereby reducing the cognitive dissonance that may lead some participants to leave the group. In addition, sticking to what is done would make easier to debate, challenge and redefine the group identity.

Despite the limited number of farmers who took part in the workshops in each community, our results illustrate the potential of the pragmatic approach to reveal and explore different collective identities. The interest of maize and of the community came up very frequently in the discussions,

as it was the focus of the workshops (Table 2). Surprisingly, among the communities working on peasant breeding of population maize, breeding was only discussed by the C community. This community was a pioneer in peasant selection in France and got farmers and collectives involved in expanding this practice. Discussions on breeding techniques explore the objectives and values of the community. After having collected and managed up to 150 populations, this community now only manages about 30. Their objective is no longer to conserve populations as they are, but to develop metapopulations according to the main types of maize and their uses. This change was motivated by the need to find a way to manage agrobiodiversity that is "economically viable" (facilitator, C community) and that will allow the evolution of the genetic resources based on needs and practices. The visit by a member of staff of a Swiss seed company played a decisive role in that shift: "He told us: 'If you want to increase the yield potential of a variety, you cross it with another variety'" (C3). Previously taboo, crossing populations and hybrids is now considered acceptable: "it is better that there is hybrid in it and that the pop is not lost" (facilitator, ABP). Regarding the recurrence of the discussion about the community, the B community, which is the most recently created in the study (Table 1), was the least involved in this subject. The farmers in B community did not know each other very well and did not know what to expect from each other. This fact also explained why they were unable to produce the discovery report, which requires mutual trust (Table 5).

The search for self-sufficiency and the reduction in work time were shared by all communities (Table 2). The importance given to climate change and soil preservation reflect the increasing pedoclimatic constraints faced by these particular communities located on a NW-SE gradient. The political project is decisive and reaffirmed for the D community whereas the economy was hardly discussed. This is consistent with the fact that this association was created to defend an idea: the promotion of cultivated biodiversity. At the time of its creation, the C community had also its own political project to justify its investment in peasant breeding of maize populations. It was rooted in the fight against GMOs and in the promotion of organic farming. This political project was not reaffirmed during the workshop. Securing the economic model of their project appeared to have taken over from ideology in the development of collective action. The difficulty involved in achieving change was mainly discussed in the C and D communities, which clearly have a more lobbying goal than the other three communities. Developing social agriculture, reducing the environmental impact of agriculture and de-intensifying production are themes that ran through all the communities. However, the E community is really marked by its involvement in a social agriculture project that respects the environment. The B community

mainly discussed one process, de-intensification, probably because, being a young community "under construction", there had not yet been time to build a shared discourse on the ends and means. The main traits of the communities can be summarised as follows:

– A is struggling with the effects of climate change. Maize, which requires irrigation in the region concerned, is no longer the priority and the quest for self-sufficiency now seems impossible to achieve at farm level. The group remained united and began to think about all-grass farming systems and community autonomy. Being very involved in maize breeding experiments, the community decided to stop all kinds of control experiments, which were considered too time-consuming and whose results were disappointing;
– B is under construction. Maize and maize breeding are not this community's priority, and it seems that they would rather work on de-intensification to adjust production to new, more perennial and drought-tolerant plant resources;
– C did not question the fact of working on maize and on its selection. However, their members came to the conclusion that their historical goal of keeping the genetic resources of maize unchanged by developing highly technical and scientific means was no longer tenable. The collective is now committed to reconciling economics, conservation, and breeding by adopting a much more pragmatic approach than before;
– D reaffirmed its political project to defend biodiversity-based agriculture. The workshop made it possible to give maize the status of a "training plant" to teach people how to produce seeds on-farm, to carry out selection and thus to manage in situ phytogenetic resources. The approach also makes it possible to consolidate the offer of training courses, which is one of the main activities of the collective.
– F ended the workshop with a renewed vision of maize as an element of diversification of farming systems that can enhance their resilience and as a cereal that can be used for human consumption. The relevance of the community as a "maize" group was questioned. Their plan is to rethink the organisation of the association to develop systemic approaches rather than organising their activities around different types of practices.

3.5 Pros and cons of the pragmatic approach

These results show that pragmatist philosophy enables the development of an original approach to support transition. This originality lies in the vision of the transition as a situation to be transformed and not as an objective to be reached. This does not mean that a vision of the future is not at play, it is, but it is embedded in the action. The facilitator of the

E community said at the end of the workshop: "I heard people talking about the difficult present but was struck by the discrepancy because I also heard people talk about a future that was attractive".

Not having to refer to a rational myth likely makes sustainable transition easily fit into the continuity of the farmers' experience. If the concept of trajectory were adopted, the trajectory would correspond to this continuity of experience and not to the steps needed to reach a potential target, like in the backcasting strategy (Robinson et al. 2011; Duru et al. 2015; Barrett et al. 2021). This rules out both pitfalls that consist in reducing community diversity to reach agreement on a common objective and/or in defining an unattainable objective. Diversity among the community members becomes a resource to develop the collective intelligence needed to solve their problems (Wenger 2010). Group facilitation then consists in organising collective support for each member to improve his/her situation. Differences and controversies among participants do not lead to exclusion as we witnessed, for example regarding the acceptability of irrigation. However, facilitation becomes demanding in terms of creating the conditions for social learning to identify and capitalise on what works and what is acceptable. On several occasions during the workshops, the question was raised of calling on scientific knowledge or undertaking research on a theme. The method could easily use an intermediation process (Steyaert et al. 2016) to articulate the inter-subjectification of experience sharing with the use of scientific knowledge that makes sense for the actors and/or for setting up research programs, among others.

In developing this pragmatic approach, we came up against two difficulties we had already encountered in a long-term action research project (Hazard et al. 2021). The first is the preponderance of project logic in the minds of actors, from farmers to researchers and, of course, agricultural advisors. This dissociates the goals from the means that is not compatible with a pragmatic approach, particularly in terms of monitoring and evaluation. Project management assesses the gap between the planned and the achieved, whereas the pragmatic approach examines the quality of the new situation created by the action. The second difficulty concerns the implementation of democracy. As Wenger (2010) says: "learning suggests doing something better, the definition of "better" is a contestable terrain". Even if the pragmatic approach makes it possible to test in action the idea of "better", the meaning given to the experience, the ethical choices would benefit from being the object of a democratic instruction. The small number of participants in our workshops is certainly due to the fact that farmers may have been perceived as a project task, among others. Nevertheless, it is certain that the pragmatic approach requires the active participation of community members in collective action to identify what works and to define what is acceptable. This requirement is perhaps the most important

part of the transition: moving from a consumer logic to that of co-producer of knowledge and innovation.

4 Conclusion

The pragmatic approach is a source of inspiration for creating facilitation methods to support the sustainable transition in professional practices. This allowed us to create a facilitation method that was missing to tackle the problem of the discrepancy between a collective action designed to bring about an agroecological transition and the singularity of the situations and individual projects of these participants. This method opens and organises a "dialogue with the situations of change", as Schön (1983) puts it, experienced by farmers. Starting from their experiences and building a shared understanding of what is at stake for them and their motivations is both feasible and promising for the reconfiguration of a group of farmers ready to tackle the challenges of the transition. The analysis of their actions shows that they are already in transition and that the challenge is to organise their support rather than to convince them to change. Pragmatic inquiry provides a solid and democratic basis for empowering farmers in the transition. Building change based on their daily problems and inserting it in their continuity of experiences will likely avoid blockages due to a normative perception of the transition made of injunctions and prescriptions. Collective action, i.e. the "common" of communities, then becomes the process of inquiry itself. By working with farmer groups that are under construction or already well established, we have shown that this inquiry can help to build a new community as well as to revitalize an old one. In this inquiry, collective identity is constantly revisited. It proceeds from an ethics of action that is revised whenever necessary in the light of new experiences. Experiencing the pragmatic approach to facilitating workshops suggests the value of designing situated social infrastructures for research, learning, and transition, an extended community of inquiry.

Declarations

References

Barrett CB, Beaudreault AR, Meinke H et al (2021) Foresight and trade-off analyses: tools for science strategy development in agriculture and food systems research. Q Open 1:1–7. https://doi.org/10.1093/qopen/qoaa002

Bouttes M, Darnhofer I, Martin G (2018) Converting to organic farming as a way to enhance adaptive capacity. Org Agric 9:235–247. https://doi.org/10.1007/s13165-018-0225-y

Braun V, Clarke V (2006) Using thematic analysis in psychology Virginia. Qual Res Psychol 2:77–101

Brédart D, Stassart PM (2017) When farmers learn through dialog with their practices: a proposal for a theory of action for agricultural trajectories. J Rural Stud 53:1–13. https://doi.org/10.1016/j.jrurstud.2017.04.009

Chantre E, Cardona A (2014) Trajectories of french field crop farmers moving toward sustainable farming practices: change, learning, and links with the advisory services. Agroecol Sustain Food Syst 38:573–602. https://doi.org/10.1080/21683565.2013.876483

Chantre E, Cerf M, Le Bail M (2015) Transitional pathways towards input reduction on French field crop farms. Int J Agric Sustain 13:69–86. https://doi.org/10.1080/14735903.2014.945316

Chizallet M, Barcellini F, Prost L et al (2018) Supporting farmers ' management of change towards agroecological practices by focusing on their work : a contribution of ergonomics To cite this version : HAL Id : hal-01853727 Supporting farmers ' management of change towards agroecological practices by . 0–10

Coquil X, Béguin P, Dedieu B (2014) Transition to self-sufficient mixed crop–dairy farming systems. Renew Agric Food Syst 29:195–205. https://doi.org/10.1017/S1742170513000458

Coquil X, Cerf M, Auricoste C et al (2018) Questioning the work of farmers, advisors, teachers and researchers in agro-ecological transition. A review. Agron Sustain Dev 38:47. https://doi.org/10.1007/s13593-018-0524-4

Darré J-P (1984) La production des normes au sein d'un réseau professionnel. L'exemple D'un Groupe D'éleveurs. Sociol Trav 26:141–156

Dass S, Kumar A, Jat SL et al (2012) Maize holds potential for diversification and livelihood security. Artic Indian J Agron (Special Issue) 57:86–91

Dewey J (1938) Logic: the theory of inquiry. Irvington Publishers, New York

Dewey J (1939) Theory of valuation. University of Chicago Press, Chicago

Dewey J (1980) Democracy and education. In: Boydston JA (ed) John Dewey. The Middle Works, 1899–1922 (Vol. 9, 1916). Southern Illinois University Press, Carbondale, pp 1–370

Dockès AC, Chauvat S, Correa P et al (2019) Advice and advisory roles about work on farms. A review. Agron Sustain Dev 39:2. https://doi.org/10.1007/s13593-018-0547-x

Dumanski J, Peiretti R, Benites JR, et al (2006) The Paradigm of Conservation Agriculture. World Assoc Soil Water Conserv 58–64

Duru M, Therond O, Fares M (2015) Designing agroecological transitions; a review. Agron Sustain Dev 35:1237–1257. https://doi.org/10.1007/s13593-015-0318-x

Fabre M (2014) Minimalisme moral et maximalisme éthique chez John Dewey. Rech En Éducation. https://doi.org/10.4000/ree.9239

Fenzi M, Couix N (2021) Growing maize landraces in industrialized countries: from the search for seeds to the emergence of new practices and values. Int J Agric Sustain:1–19.https://doi.org/10.1080/14735903.2021.1933360

Gevers C, van Rijswick HFMW, Swart J (2019) Peasant seeds in France: fostering a more resilient agriculture. Sustain 11:1–22. https://doi.org/10.3390/su11113014

Hatchuel A, Molet H (1986) Rational modelling in understanding human decision making: about two cases studies. Eur J Oper Res 24:178–186

Hazard L, Couix N, Lacombe C (2021) From evidence to value-based transition: the agroecological redesign of farming systems. Agric Human Values. https://doi.org/10.1007/s10460-021-10258-2

Hutter M, Farías I (2017) Sourcing newness: ways of inducing indeterminacy. J Cult Econ 10:434–449. https://doi.org/10.1080/17530350.2017.1326969

Klerkx L, Begemann S (2020) Supporting food systems transformation: the what, why, who, where and how of mission-oriented agricultural innovation systems. Agric Syst 184:102901. https://doi.org/10.1016/j.agsy.2020.102901

Loeber A, van Mierlo B, Grin J, Leeuwis C (2007) The practical value of theory: conceptualising learning in the pursuit of a sustainable development. In: Wals AEJ (ed) Social learning towards a sustainable world. Wageningen Academic Publishers, Wageningen, pp 83–97

Lorino P (2018) Inquiry: the process of thinking, acting, and mediating. Pragmatism and organization studies. Oxford University Press, Oxford, pp 94–123

Magne M-A, Quénon J (2021) Dairy crossbreeding challenges the French dairy cattle sociotechnical regime. Agron Sustain Dev 41.https://doi.org/10.1007/s13593-021-00683-2

Mawois M, Vidal A, Revoyron E et al (2019) Transition to legume-based farming systems requires stable outlets, learning, and peer-networking. Agron Sustain Dev 39:14. https://doi.org/10.1007/s13593-019-0559-1

Metcalfe M (2008) Pragmatic inquiry. J Oper Res Soc 59:1091–1099. https://doi.org/10.1057/palgrave.jors.2602443

Robinson J, Burch S, Talwar S et al (2011) Envisioning sustainability: recent progress in the use of participatory backcasting approaches for sustainability research. Technol Forecast Soc Change 78:756–768. https://doi.org/10.1016/j.techfore.2010.12.006

Rodriguez D, deVoil P, Power B et al (2011) The intrinsic plasticity of farm businesses and their resilience to change. An Australian example. Field Crops Res 124:157–170. https://doi.org/10.1016/j.fcr.2011.02.012

Rodriguez D, Cox H, deVoil P, Power B (2014) A participatory whole farm modelling approach to understand impacts and increase preparedness to climate change in Australia. Agric Syst 126:50–61. https://doi.org/10.1016/j.agsy.2013.04.003

Roesch-McNally GE, Arbuckle JG, Tyndall JC (2018) Barriers to implementing climate resilient agricultural strategies: the case of crop diversification in the U.S. Corn Belt. Glob Environ Chang 48:206–215. https://doi.org/10.1016/j.gloenvcha.2017.12.002

Schnelle E, Thiersch M (1979) The metaplan-method: communication tools for planning and learning groups. Metaplan Series No.7, from Metaplan GmbH, 2085 Quickborn, Goethestrasse 16, Germany

Schön DA (1983) The reflective practitioner : how professionals think in action. Basic Books, New-York

Slimi C (2022) La transformation des situations des agriculteurs et agricultrices en transition agroécologique :analyse du soutien des collectifs de pairs par le prisme de la théorie de l'enquête. Ecole Doctorale ABIES, AgroParisTech, Paris

Slimi C, Prost M, Cerf M, Prost L (2021) Exchanges among farmers' collectives in support of sustainable agriculture: from review to reconceptualization. J Rural Stud 83:268–278. https://doi.org/10.1016/j.jrurstud.2021.01.019

Steyaert P, Barbier M, Cerf M et al (2016) Role of intermediation in the management of complex sociotechnical transitions. In: Elzen B, Augustyn A-M, Barbier M, van Mierlo B (eds) AgroEcological Transitions : changes and breakthroughs in the making, Wageningen. Wageningen University Research, Wageningen, pp 257–282

Thorén K, Vendel M (2019) Backcasting as a strategic management tool for meeting VUCA challenges. J Strateg Manag 12:298–312. https://doi.org/10.1108/JSMA-10-2017-0072

Tittonell P (2014) Ecological intensification of agriculture-sustainable by nature. Curr Opin Environ Sustain 8:53–61. https://doi.org/10.1016/j.cosust.2014.08.006

Ulbrich R, Pahl-Wost C (2019) The German permaculture community from a community of practice perspective. Sustain 11:1241. https://doi.org/10.3390/su11051241

Wenger E (1998) Communities of practice: learning, meaning, and identity. Cambridge, Cambridge

Wenger E (2000) Communities of practice and social learning systems. Organization 7:225–246. https://doi.org/10.1177/135050840072002

Wenger E (2010) Communities of practice and social learning systems: The career of a concept. Social Learning Systems and Communities of Practice. Blackmore C (ed). https://doi.org/10.1007/978-1-84996-133-2_11.