

Participatory design of agroecological farming systems needs to match the collective goal of transformation with farmers' professional projects

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Abstract: Transforming agricultural systems toward more sustainable production pathways is a current societal demand. Researchers are invited to take part in and to account for this transformation. Consequently, some of them use participatory approaches to re-design farming systems, embedding farmers in the process in order to increase the success of effective transformations. However, the inclusion of the farmers does not always ensure that real transformations will occur. This uncertainty stems from the possible gap between the individual projects of farmers and the collective project that set the transformation goals. We believe that filling this gap requires taking account of and understanding the farmer's situation: the one on which he can actually act. To explore these tensions between the individual and the collective sides, we analyzed a participatory project led by five farmers among a group of 100 dairy sheep farmers located in the south of France. The objective of these five leading farmers was to design a method to trigger the agroecological transformation of farming systems by showing the other farmers that it is possible to improve at the same time their income, their autonomy and to protect the environment. Our analysis of the first steps of this project suggests that taking farmers' professional projects into account when willing to facilitate the transformation of farming systems allows them to effectively consider possible changes in their system. As such, transforming agricultural systems calls for participatory approaches that take farmers' individual projects into account and help them to define their specific situation, identifying the levers that they can actually activate to change it.

Keywords: Agroecology, action research, co-design, professional project, dairy sheep farmers, Roquefort AOC region.

1- Introduction

Transformation of agricultural systems towards more sustainable ones is a current issue that has to be considered at different levels. From an individual perspective, it calls for a transformation of farming activities (Béguin & Pueyo, 2011; Coquil, X., Béguin, P., Fiorelli, J.L., Trommendchlager, J.M., Dedieu, 2012) so that farmers and agronomists learn to work more with nature instead of against it (Mayen, 2014). At the same time, the design of sustainable food systems requires the integration of farmers' knowledge and their participation in the design process, which calls for more participative, local and collective innovation processes (Altieri & Nicholls, 2008; Guzmán, López, Román, & Alonso, 2013; Warner, 2008).

To deal with this issue, agronomists involve themselves in participatory approaches in order to design more sustainable agricultural systems (Bos, Groot Koerkamp, Gosselink, & Bokma, 2009; Meynard et al., 2012; Lefèvre, Capitaine, Peigné, & Roger-Estrade, 2014; Moraine, 2015). One of the current problems is that implicating agricultural stakeholders in the design process does not guarantee that transformation will actually occur in the real world (Sanders, Stappers, Steen, Kuijt-Evers, & Klok, 2007).

Other researchers study the ongoing transformation process on farms and territories where stakeholders are involved in sustainable transformation pathways (Chantre, 2013; Coquil, Beguin, Lusson, & Dedieu, n.d.; Gowing & Palmer, 2008; Lamine, Meynard, Perrot, & Bellon, 2009). At the farm level, the transformations that will take place are far more complicated than simple changes in techniques and practices. For farmers, it calls for a redesign of their activity more than of their technical systems (Coquil, 2014). This process takes time and must be achieved “step by step” (Coquil et al., 2011). It corresponds to an evolution of practices, norms and values (Coquil, 2014), and is linked to the evolution of the internal situation on the farm, as well as to the way that the farmer’s environment and networks develop (Magne & Cerf, 2008).

We think that there is a gap between objectives that are collectively designed in a participatory project that aims at promoting the agroecological transformation of farming systems, and what farmers are willing and able to do on their farms, linked with the evolution of their individual situation and project.

To resume that gap, we propose to analyze a participatory project led by five farmers among a group of 100 dairy sheep farmers located in the south of France. The aim of this project is to trigger the agroecological transformation of farming systems by showing the other farmers that it is possible to improve at the same time their income, their autonomy and to protect the environment. We were involved with the leading group in that project within a participatory action-research perspective. During a co-design process, we built two agroecological diagnostic tools for the local dairy sheep farming systems and defined the desirable state to be achieved in order to improve them. We analyzed what happened when the five leading farmers presented the project and the first results to the other farmers in the association. We discovered that it is necessary to take account of and to understand farmers’ individual projects when willing to co-design the transformation of their farming systems.

2- Materials and methods

2.1-Case study: the SALSA project

The SALSA project is a project established and led by the AVEM Association (Millavois Association of Veterinarians and Farmers). AVEM is an association where veterinarians are employed by members to provide classical veterinary services as well as to visit the farm two or three times per year at critical moments of herd management. The association has developed a health methodology based on ecopathology using a preventive approach, working with farmers on herd management. The association is also a training and learning group that organizes training workshops, promotes the exchange of knowledge between veterinarians and farmers, and carries out development projects. The association counts 160 farms today, mostly dairy sheep farms, three veterinarians and one agronomist who is in charge of coordinating different development projects.

The SALSA project is one of them and has been set up by a group of five leading farmers. The aim of this project is to trigger the agroecological transformation of farming systems by showing the other farmers the association that it is possible to improve at the same time their income, their autonomy and to protect the environment. The first task of the project was to build agroecological diagnostic tools for dairy sheep farms and to implement them on all the farms to highlight good practices and levers to be used to develop a sound agroecology. In the second part of the project, they asked INRA to propose a methodology to accompany the system redesign. The working committee of the project includes the five leading farmers, one of the veterinarians and the association's agronomist (who is in charge of running the project), a local farmer's organization that provides technical and economic advice for farms (the CETA organization, “de l’herbe au lait”), the Grandes Causses Regional Park (south of

France, Roquefort AOC area), INRA of Toulouse (the three authors) and a local agricultural high school.

During the first year, the working committee met together seven times to build the diagnostic tools. Farmers chose to adapt two existing tools that they had already used in the past for other projects. The working committee designed two different tools: a multi-criteria assessment tool of the impact of the farm on the environment and natural resources, and a technical-economic calculation tool to evaluate the milk produced autonomously on the farms (without feed or chemical inputs). During the first phase of the work, the leading farmers were very involved in the tool design. The choice of indicators to be included in the environmental assessment of farms and how to weight them for aggregation were subject to strong debates. But more than that, they were an illustration of different visions of the desired agricultural model. These debates between farmers more or less stopped the day we obtained the first diagnostic results that we were able to synthesize on one graph, where the x-axis represents the global grade the farm received with the environmental assessment, and the y-axis the rate of milk produced autonomously on the farm. This representation of the results established a sort of consensus about the objectives of the project: to increase the level of autonomy that prevents the farm from being too dependent on external resources, while reducing its impact on the environment. The general idea behind this is to improve the efficiency of farms by more effectively managing the link between herd size and the agronomic potential of the farm.

After one and a half years of work, the global diagnostic had been implemented on 15 farms, including those of the five leading farmers. The survey was conducted by the AVEM agronomist for the environmental assessment and by the CETA technician for the rate of milk produced autonomously on the farm. At that point, the working committee decided that it was important to start communicating about the project in order to find out who was interested and who would be ready to participate in the next steps to promote changes on their farms. At that point, we decided to organize presentation workshops to present the project and the first results obtained with the agroecological diagnostic to the other members of the association. To encourage participation, we decided to organize four local workshops in the four historical areas of AVEM. In each one, one of the five leading farmers presented the project and the results of the diagnostic for his case. That communication is based on the results of our observation of the first year and a half of that project and, more specifically, on what happened in these workshops.

2.2-Methods

a- A participatory action-research approach with an accompanying perspective

The researchers participated in the project from the very beginning of the process since they helped the farmer's association to draw up the project. In this project, they were members of the working committee and responsible for coordinating the last task: building a method to accompany the re-design of the farming system.

The three researchers developed a participatory action-research methodology. Participatory action-research is a research approach where the aim of research is not only to understand a given problem but as well to provoke changes through action. Researchers immerse themselves in the context of the subjects they study, with the objective of encouraging them to become co-investigators of the research (Foth & Axup, 2006). As a matter of fact, the researchers wanted to investigate the design methodologies and concepts in a context of farming system transformation in order to explore their interest in and relevance to the agroecological transformation of farming systems.

In the first part of the project, they were active observers (Soulé, 2007). The objective in that first stage was to understand the situation they were involved in and to understand the farmers' needs and motivations to be involved in that project. To do so, they participated in all of the working committee

meetings and led a series of 20 comprehensive interviews with members of the AVEM Association to better understand the diversity of farming systems and practices in the association and to form a better idea of farmers' needs and projects beyond the leading group.

Our analysis of these interviews has been a basis for discussing the advancement of the project. In fact, we showed the diversity of farmers' concerns and projects, raising the question of how to involve this diversity of farmers in the next step of the project. This led to the organization of the workshops where we proposed to organize a participative activity to collect participants' opinions about the project and to explore their will to participate in that project in the next steps.

b- Methods for collecting material and analysis

Together with the working committee, we organized the workshops in two parts. The agronomist, the CETA technician and the representative farmer of the leading group were in charge of coordinating the first one. The objective was to present the project and its objectives, the diagnostic tools that had been designed and the diagnostic results for the case of the leading farmer, in comparison to the 15 other diagnostics done, which were anonymous. We were in charge of coordinating the second part in order to collect the participants' opinions about the project and to start discussing their will to be involved in it in the future. To do so, we used a metaplan methodology to provide all of the participants with the opportunity to express their opinions about two questions: (1) Are you interested in the SALSA project? (Explain why); (2) What would you like to do in the next steps of the project? The workshops lasted between two and three hours.

Table 1: Table presenting the four different workshops we participated to.

Workshop	Region	Date	Number of participants	Case presented
1	Ma Region	27/11/2015	13 (10 organic farmers + 3 conventional)	Farmer 1
2	Mi Region	30/11/2015	3 (2 organic farmers + 1 conventional)	Farmer 4
3	L Region	30/11/2015	8 (6 organic farmers + 2 conventional)	Farmer 2 (farmer 3 present but not presenting his case)
4	V Region	08/12/2015	6 (6 organic farmers)	Farmer 5

We totally participated in the four workshops and recorded them. We only transcribed the exchanges with and between participants and the leading farmers' interventions. We then analyzed the transcript using a content analysis methodology to identify and compare participants' reactions for each workshop (Berg & Lune, 2012). Next, we analyzed that reaction regarding the context of each workshop and the way the project had been presented, and the leading farmers presented their results and their specific case to the others.

On the basis of the analysis, we observed that one of the workshops was different compared to the three others, both in terms of the presentation of the case and in terms of the participants' reactions. We decided to illustrate our results by comparing two workshops (workshop 1 and workshop 3), which were the most representative of these two different reactions. To compare the two workshops, we built a table of comparison with the following elements: (1) the diagnostic results for the farmers presenting their case; (2) the way leading farmers reacted to the presentation of their case; (3) the way leading farmers talked about the SALSA project regarding their personal project; and (4) the way participants reacted during the project presentation and first results.

3- Results:

We summarized the proceeding of workshops 1 and 3 on a table that compared: (1) the diagnostic results for the farmers presenting their case; (2) the way leading farmers reacted to the presentation of their case; (3) the way leading farmers talked about the SALSA project regarding their personal project; and (4) the way participants reacted during the project presentation and the initial results.

We chose to present these two workshops because they were representative of the different reactions we observed in the four workshops (See table 2). In fact, in workshops 1, 2 and 4, participating farmers were quite interested in the project, and the leading farmers presenting their case expressed their will to continue with the project, starting to imagine some changes they could implement on their own farms. On the contrary, in workshop 3, both participants and the farmer from the leading group were less receptive to the project and formulated more criticisms and hesitations about the future of the collective project.

Analyzing those two workshops we observe three main results: (1) When presenting their diagnostic to the others, farmers do not enter into the detail of their practices, but they explain their past and present choices and their personal project; (2) Workshops do not go the same way depending on whether the farmer's personal project corresponds to the goals of the SALSA project; and (3) The groups with which we conducted the workshops seem to influence participant reaction.

If we compare the proceedings of workshops 1 and 3, we observe that the two farmers who presented their diagnostic to the others did not react the same way. In the first workshop, farmer 1 tried to explain the cause of his results to the others. Doing so, more than describing his practices, he explained the past choices he made, which led him to his situation today. His project today is to find a way to reduce work and find an organization where he would be less constrained by herd care. He expressed his interest several times for the project to help him to think about what he could do better now. In the third workshop, the farmer who was also participating in the project from the beginning appeared to be more skeptical about his results and the project philosophy. He criticized the criteria chosen and the calculations made in the diagnostic several times. At one point, he even expressed his disagreement with some general objectives of the project. His project is to produce cheese on the farm using rangeland pasture. Buying dry alfalfa is a way to secure his production. He is not looking for more efficiency in his practices and does not want to improve his productivity. When explaining the cause of his diagnostic results to the others, he seemed to be quite satisfied with the way he manages his farm now and does not express the desire to change anything, at least not in the perspectives proposed by the project.

Moreover, we observe a different reaction of participants in these two workshops as well. In workshop 1, participants were less critical about the project and the diagnostic tools. They were also more constructive about understanding the situation of farmer 1, with some of them trying to help him to think about what he could do to progress. In workshop 3, on the contrary, they criticized the tools and the project, and some of them clearly disagreed with the project philosophy. Farmers from the Ma region that came to workshop 1 were almost all from the same dairy as farmer 1, which means they have the same rules for milk production (few limitations in terms of volume, incentives to produce as much as possible outside the natural milk production period of ewes, etc.). We think that this could be an explanation of their more positive reaction to the project. Moreover, they proposed to continue the work collectively with the dairy. Farmers that participated in workshop 3 had more heterogeneous sales channels and seemed to believe that they have very different soil conditions within the L region, which made the comparison and collective work less relevant from their point of view.

	Diagnostic result	Farmer's reaction to the presentation of his case.	Match between individual and collective project	Participant reactions
Workshop 1: Farmer 1 (Region Ma)	<p>Farmer 1 has an organic farm of 150 ha and breeds 630 ewes for a milk production of 2200 hL of milk per year, which he delivers entirely to the T dairy.</p> <p>His farm is positioned on the upper mean of the group for environmental evaluation for the 2013 season. However, in the same period, he obtained a negative rate of autonomy for his milk production.</p>	<p>When the facilitator presented the diagnostic results, farmer 1 explained that when he converted to organic farming, he started with the T dairy, which did not limit him on the amount of milk he could produce, at a fairly good price. He said that at that time, he had a big loan to reimburse, so he thought that “for that price, it worth it to buy feed inputs and produce more”. He added, “We want a good regularity in the production, we aim more or less at 300 L/ewe, so it’s not easy to know if you should reduce the herd a little or not [...]. It’s more comfortable to buy, and it’s one of the difficulties we face on our type of farm”.</p> <p>Later in the meeting, one of the participants asked him to explain what he wishes to do and change now that he knows the results of the diagnostic. He answered, insisting again on the fact that now, he still has pressure from the bank to reimburse his loan, but he will soon be under less pressure. He added: "It’s true that now I am starting to get older and I am wondering if I shouldn’t think differently, like “my farm size is such and such, I have one particular soil, what can I do with it?”. I’d like to find a way to maybe work a little less, and I'd rather see the social aspects. I now have one worker, maybe we could see if we could be associates tomorrow, or maybe have two workers... etc. Is my farm easy to transmit? “</p> <p>Then he said he did not know if three people working on the farm would be possible without having more ewes, which was not his idea because he thought it would have an even greater environmental impact since it would mean buying more inputs. The facilitator answered that maybe it would be more coherent to try to see what could be done with fewer ewes and less inputs. He agreed on that.</p>	<p>The farmer explained that he thinks the project philosophy is to help farmers (including himself) to think about what they could improve in their system to reduce incoherencies between farm size and herd size.</p> <p>The farmer explained that he is asking himself if he could reduce the number of ewes and the quantity of milk produced on his farm in order to make the size of the herd correspond better to the size of the land.</p> <p>The farmer said that he wishes to improve his welfare at work and he is wondering what he could do to do so.</p>	<p>They expressed their interest in the diagnostic and the project and, more specifically, they were interested in the possibility of evaluating their environmental impact.</p> <p>Proposition to improve the diagnostic tools by adding social criteria.</p> <p>Proposition to continue the project with the dairy to communicate about good practices and see if milk contracts could be better matched to the size and potentialities of farms.</p>
Workshop 3: Farmer 3 (Region L)	<p>Farmer 2 has an organic farm of 270 ha where he breeds 320 ewes, for a milk production of 650 hL. He transforms 1/3 of this</p>	<p>When the facilitator showed the diagnostic of farmer 2 on the graph, farmer 2 asked what the result of autonomy meant: “so does it mean that I am like 60% soilless?” After explaining that this result meant that he was ensuring all the maintenance, plus 40% of the farm production with internal</p>	<p>Farmer 2 let farmer 3 present the project. Farmer 3 explained than from his point of view, the core objective of the project is to question the link between the</p>	<p>Some participants think it is complicated to compare farms because of the diversity of soil conditions.</p> <p>Participants were critical about the</p>

	<p>amount on the farm to sell cheese at the farm and on local markets. The other part of the milk is sold to the Roquefort industry.</p> <p>His farm is well positioned for the environmental evaluation for the 2013 season (among the best). He obtains a rate of milk produced in autonomy on the farm that corresponds to the mean of the group.</p>	<p>resources, the facilitator pointed out that the result was also due to the type of feed inputs he bought (dried alfalfa).</p> <p>Farmer 2 answered that for him, the environmental impact of dried alfalfa was over-estimated from his point of view compared to the cost of other products like soy meal. Then he explained: “ I am not looking for my ewes to produce too much. I think that if it was more than 150 L, I would have to feed them a lot to maintain their condition. And using the rangeland is an assumed decision on our farm [...] Then, about the choice of dried alfalfa, it’s for the ration equilibrium. Before, I was buying soy meal. And it’s the cheese production that made us change, for the equilibrium of the ration, it’s easier to use [...] Besides, we don’t have much cereal. And this year, I used the dried alfalfa and I find them in better condition. Feeding them cereals bothers me because I have the impression they don’t digest it well. I see the seeds in the dung when I lead them on the road... And Olivier [the vet] told me to try the dried alfalfa and I recognized that... But I don’t want to defend it. But... It’s a choice. ”</p>	<p>soil and herd and to work on the efficiency of the practices to improve the autonomy and environmental impacts. He then insisted on the importance of being able to compare farms to be able to see what the others do differently and think about changes to be made.</p> <p>Farmer 2 said several times that the tool could be improved and that he is not absolutely convinced by the calculations made.</p> <p>“I agree with Mathieu, we lack economic criteria”.</p> <p>“I understand the criticism. It’s true that I am not always looking for more efficiency”</p> <p>Farmer 2 did not express the desire to make changes on his farm now.</p>	<p>philosophy of the project.</p> <p>“I don’t really agree, because I have always been skeptical about the quest for more autonomy. It depends on where you are. It depends on whether you transform or you sell your milk and how much you sell it for. Because, when you see our type of soil, if you sell your milk well, between what you buy and what you sell, it can be good for the farm”. Others thought the idea was good because some of the dairies would soon have to impose a maximum level of inputs to respect new requirement specifications.</p> <p>Proposition to improve the diagnostic tools by adding social and economic criteria.</p> <p>Most of the farmers said they were interested in implementing the diagnostic on their farm.</p>
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Table 2: Table describing the proceedings of workshops 1 (Ma Region), and workshop 3 (L Region) regarding the way the leading farmer and participants reacted to the presentation of the project and the results of the diagnostic for leading farmers.

4- Discussion:

The description of these two workshops showed the importance of taking individual farmer's projects into account when they were willing to co-design the transformation of their farming systems: (1) to ensure that the collective project match the project of the farmers by offering them the role of co-designers; and (2) to give them the opportunity to express their individual project and to put them in the position of thinking about which changes could be made on their farm. In fact, in the first part of the SALSA project, when the diagnostic tools were co-designed with the farmers, debates between the leading farmers about what should be evaluated and what weight should be given to each indicator were very rich. They disagreed on what should be considered as the ideal situation to aim for: for example, “Is it an end in itself to achieve organic farming?” or “Is it better for the environment to buy dry alfalfa that comes from Spain and conduct your herd extensively on rangeland, or to intensify pasture and forage production to be more autonomous?”. Even when we reached a form of consensus on co-designing tools, some disagreements still existed. Comparing farmers 1 and 3 reactions’ in the two workshops confirms this. We think this first observation calls for a feedback on the methodology we used to design the diagnostic tools. In fact, the tools we built with farmers are very normative and carry strong assumptions of what is the desired state to aim. This type of tools has an interest to start individual reflection and, if they are built locally, they can help in comparing farms, but they carry several limitation to transformational process of farming systems: they promote a standardized vision of what should be the ideal situation to aim and they do not allow to consider the territorial dimensions which it is necessary to take into account to deal with systemic changes (Barbier & Lopez-ridaura, 2010). This observation questions the value of the collective consensus obtained: does it have a generic value because it has been defined locally, during a process led by a group of farmers themselves? Some authors think that searching for collective consensus is a break engaging people into collective action (Russell & Ison, 2000). We suggest to explore methods that favor the expression of controversial issues. They would give a better opportunity to people to think about what compromises they are ready to make regarding their specific situation.

The diagnostic tools and the overall project philosophy should have led participants to talk about technical issues and farm practices. However, when farmers presented their results in the two workshops, they talked also about their past and present choices unveiling their own norms and values. This result outlines the importance of considering the transformation to take place from the point of view of the farmer who is going to implement it. This echoes the work done by Coquil et al. (Coquil et al., 2011) when exploring the transition to autonomous dairy systems from the farmer's perspective. These authors proposed seeing this transition as a transformation of the farmer’s professional world as a whole and not only of his technical system. Farmers are re-designing their professional activity “step by step”, trying to solve incoherencies they meet in their activity. For that reason, farmer’s personal situation and their professional project should be taken into account to design changes to take place in the long run. Consequently, farmers should be given an opportunity to explain them in the collective process.

To conclude we think it would be relevant to put the transformation of farmers’ activities at the core of the transformation process of farming systems. In a context where agroecological transition is to be defined locally and partly collectively (Duru, Fares, & Therond, 2014; Guzmán et al., 2013), the challenge is to coordinate the design of a collective project setting goals and means to change, with the re-design of farmers’ activities at an individual level. This stems from the development of participatory methodologies that places professional development at the heart of the co-design process (Béguin & Pueyo, 2011; Gorli, Nicolini, & Scaratti, 2015; Vänninen, Pereira-Querol, & Engeström, 2015). This type of intervention calls for a facilitating researcher, who’s role is more to help the

development of the resources needed by farmers to transform their activity (Beauvais & Haudiquet, 2012). Lastly, a challenge for further research is to adapt or develop reflexive methods and settings that will help farmers to record and discuss the consequences of their choices. Together with co-design methods it will create a set that will reinforce farmer's authorship in the redesign of its own farming system.

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