

Agroecological transition: human skills and social life matter for local actors

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Abstract: *Agroecology aims at developing sustainable farming and food systems, adapted to local contexts. Developing agroecological systems requires the engagement of local actors and the consideration of their knowledge. As the main field operator of the agroecological transition, farmers have a key role: they make the final decisions on their farms and they know the particularities of their farm. So far, research, farm advisory and policy have mainly shown interest in farming practices developed by farmers, neglecting other aspects of their work and life. Moreover, many actors other than farmers play a role in the agroecological transition, and they each have their own reasoning concerning this transition. Indeed, when making a decision about farming and food systems, local actors take into account different types of knowledge (empirical, technical, scientific, local, generic.), in different domains related to agroecology (economic, environmental, social, political). In this study, we analyzed the reasoning of diverse actors, including farmers, farm advisors, natural park managers and politicians. We conducted 33 semi-structured interviews, during which the local actors drew cognitive maps to explicit their reasoning concerning their agroecological transition. Their reasoning revealed an unexpected emphasis on the importance of human abilities and social life in the success of agroecological transition. These results enable to better characterize the “social” aspects in agroecology, including both internal aspects such as one’s values, feelings and capacities and external aspects such as relationship management and the capacity of different actors to work together.*

Keywords: *Participatory; Local actors’ reasoning; Cognitive maps; Agroecological transition; Agroecology; Social life; Human abilities*

Introduction

Agroecology is characterized as a science, a farming practice and a social movement (Wezel, 2009). As a science, it is an integrative study of the ecology of food systems, encompassing ecological, economic and social dimensions (Francis, 2003). As a practice, it is based on the use of ecological processes present in agroecosystems in order to develop favorable farming conditions (Duru et al, 2015; Martin et al, 2015; Sabatier et al, 2015). As a movement, it ranges from a farmers’ group movement for rural development to a political movement for the development of alternative agriculture (Wezel, 2009). Agroecology does not offer a one-size-fits-all solution, and is the subject of debate among scientists and society (Simonneaux et al, 2016).

Developing agroecological systems requires the engagement of local actors and the consideration of their knowledge (IAASTD, 2008; De Schutter, 2010; SCAR, 2011; Girard, 2014; Duru, 2015). This calls for a repositioning of institutions and farmers regarding farming knowledge management, who have mostly operated a “top-down” knowledge transfer, from research, to farm advisors, to farmers (Chevassus-au-Louis, 2006; Girard, 2014; Kay et al, 2015). In reaction to this, bottom-up approaches have emerged, where innovations created by farmers are spotted and used by other stakeholders (Chambers, 1983; Biémar et al, 2008; Kay et al, 2015; Bijttebier et al, 2015).

Farmers play a key role as the main field operator of the agroecological transition. For this reason, research, farm advisory and policy have mainly shown interest in considering farmers' knowledge, and especially farmers' technical knowledge. In agroecological systems, farmers adapt their production and farming practices to their farmland's conditions. Farmers thus generate abundant knowledge concerning their farmland and develop new farming practices (Chevassus-au-Louis, 2006; Vanwindekens, 2014; Kay et al, 2015). This knowledge, referred to as "situated" or "professional" (Rogalski, 2004; Valléry, 2004), is little capitalized and valued. And farmers also hold knowledge other than technical, which is even less considered by research and policy, although it is essential to integrate reflections in broader environmental, social, cultural and economic domains (Francis, 2003, Beudou, 2017).

Farmers make management decisions according to their own socio-scientific reasoning, which takes into account different types and areas of knowledge: technical, scientific, social, economic, political, as well as their personal values and their perception of risk and uncertainty (Morin et al, 2014). Studying their reasoning thus requires a systemic approach. The interactions between different aspects of agroecology and farming in general (technical, scientific, economic, environmental, social, political) are most often not taken into account in scientific approaches and in farming support tools. These tools and approaches are thus not adapted to the farmers' systemic reasoning (Isaac et al, 2009; Duru et al, 2015).

Moreover, farmers are embedded in a network of stakeholders who play a role in their decision-making concerning their farm. Farmers mainly take advice concerning farming practices from their peers or farm advisors (Ryschawy, 2015). In agroecology, farmers need to exchange knowledge among themselves and with other farming actors (advisors, researchers, institutions) in order to develop mutual learning and co-construction of knowledge (Callon, 1999; Cerf et al, 2000; Bijttebier, 2015; Kay et al, 2015). Research and policy rarely consider these other stakeholders' reasoning and role in the agroecological transition as a whole.

In this research, the first author interviewed different farming stakeholders in a small area of France (Natural Regional Park of "Grand Causses", South Aveyron), participating in a transition to agroecology. She conducted 33 semi-structured interviews with farmers, advisors, natural park managers, local elected officials, and other services related to farming (trade, bank, social security). During each interview, she collected the local actor's reasoning about their agroecological transition by drawing a cognitive map. Cognitive mapping is a systemic representation tool, adapted to local actors' systemic reasoning (Gouttenoire, 2010; Christiansen, 2011; Vuillot, 2015; Bijttebier, 2015; Tardivo, 2016). On their cognitive maps, the interviewees highlighted the elements which are most important to them concerning agroecology, as well as the limits and levers they perceive. We analyzed the elements they noted as most important and calculated the proportion of the different domains of agroecology (economic, social, environmental, political and technical) represented in their cognitive maps. In this communication, we present elements revealed by these local actors which enable to better characterize the social aspects of agroecology, which holds crucial limits and levers for the agroecological transition.

Materials and methods

Case study: Agroecological transition stakeholders participating in a futures study project in the South of France

We are working with a group of stakeholders transitioning to agroecology, located in South Aveyron, France. These local actors are co-conducting with us a European-funded "Operational Group for European Innovation Partnership" (OG EIP) entitled "Initiative for Local Agroecological Innovations", which involves both research and diverse local actors such as farmers, farm advisors, an agricultural school and a Natural Regional Park in France. This underlying project is led by the Agricultural Chamber of Aveyron, France, and has a steering committee composed of the previously mentioned stakeholders, which meets every 3 months. The perimeter of this project is the area of a natural regional Park ("Parc

Naturel Régional des Grands Causses”), which is classified UNESCO. The objective of this underlying project, defined by these local actors, is to create a network of agricultural stakeholders in the area in order to operationalize a knowledge exchange that supports the transition to agroecology. Several actions are conducted within this underlying project, including farm visits and seminars on agroecological practices, as well as a futures study project.

In order to help the stakeholders structure their transition to agroecology, we suggested to undertake a strategic futures study. A futures study is usually composed of the following steps: understanding the current situation concerning an issue and studying different possible evolutions of this issue (Godet, 2004; Masini, 2006; Berger 2007). In a strategic futures study, there is also a definition of a desired state and identification of means to reach this desired state (Godet, 2004). The futures study we undertaking is participatory and based on the local actors’ reasoning, as opposed to being based on scientific or consulting experts’ reasoning. Rather than bringing readymade knowledge and solutions, we facilitated co-learning between actors, in order to enhance their understanding of their systems and to help them define individual and collective actions to build their desired futures.

In this futures study, we started with a round of interviews to collect individual reasoning concerning the question of the futures study. The next steps were four workshops during which the local actors collectively defined desired and non-desired futures and strategies to reach the desired futures, building upon the interviews’ results. A second round of interviews will be undertaken to study the evolution of individual reasoning. In this paper we present the results from the first round of interviews, which illustrate the stakeholders’ individual reasoning before the workshops took place.

Participatory action-research

In order to study the local actors’ reasoning, we chose to undertake an action-research approach. This enables us to both collect their reasoning during the transition and interact with them in a “horizontal” way for knowledge exchange and decision-making concerning the study. The issues studied were chosen by the local actors, the methods used were chosen by the researchers and the analyses were mainly done by the researchers and validated by the local actors.

The local actors chose the question guiding the futures study (which includes the interviews) during two steering committee meetings of the underlying project. They chose to focus the futures study on the following question:

“How to create the conditions to increase jobs in sustainable farming respecting agroecological principles in the Grand Causses Regional Natural Park by 2035?”

We thus focused on this question during the interviews (and the following workshops) with the local actors, but it is not directly our research question. The research questions we focus on in this article are “What are the local actors’ reasoning concerning an agroecological transition? What are their goals and the levers and obstacles they perceive?”

Half of the people the first author interviewed were the members of the steering committee of the underlying project (sheep dairy farmers, farm advisors from different institutes, an agricultural school representative, a natural park manager), which were chosen by the Agricultural Chamber. The other half were chosen together with researchers and members of the steering committee and they were interviewed according to their availability: diverse farmers (sheep milk, cow milk, cow meat, pig meat, vegetable and fruit production), park managers, an organic farmer association, a small milk cooperative, a territorial unit responsible for keeping the UNESCO classification, a banker, a farmer social security representative, a farm material dealer and local elected representatives.

Data collection: cognitive mapping interviews

A cognitive map is defined as a graphical representation of a person's perceptions concerning a particular domain (Axelrod, 1976). It is formed of words written in speech bubbles, and of arrows which link the speech bubbles.

Cognitive maps can represent key elements of actors' reasoning in a summarized form. This makes them a valuable communication and analysis tool in a consultation framework, where actors must confront different perceptions (Eden et al., 1992). In addition, this tool enables the researcher to work with more or less defined elements and without a precise understanding of the links between them, but with a vague (or "fuzzy") description, with degrees such as "a little" or "a lot" (Kosko, 1986). Therefore, cognitive maps are well adapted to collect local actors' knowledge. Moreover, cognitive maps enable a systemic representation of the actors' reasoning, which is essential to adapt to their systemic reasoning (Gouttenoire, 2010; Duru et al, 2015; Ryschawy, 2015; Toffolini, 2016). Cognitive maps have been successfully used to represent knowledge of diverse sources and natures from local stakeholders (Gouttenoire, 2010; Christiansen, 2011; Vuillot, 2015; Bijttebier, 2015).

Although it is easy and quick to explain the principle of cognitive maps, not all actors feel comfortable with their formalism. Indeed, drawing cognitive maps requires certain visualization and information coding capacities which are not necessarily intuitive processes. This can limit certain processes of reasoning. Moreover, cognitive maps have a limited lifespan. Indeed, they model an individual's perception of a given object at a certain time, whereas mental perceptions are prone to change (Prigent, 2006). It is important to note that we use this tool as a thinking and discussion tool. Finally, the information collected by the interviewer can be biased by his presence. In order to reduce this bias, as recommended by Özesmi (2004), the interviewer created her own cognitive map before starting the survey, answering the same question that she would ask the interviewees, and highlighting the same type of elements that she would ask them to highlight (most important for her, obstacles, levers for action...). As this process brings more awareness of one's own mental representation of the object of study, one is less likely to be unconsciously influenced by it during the survey (Özesmi, 2004). This also enables the interviewer to further understand the exercise and be all the more able to explain it. The interviewer felt that this practice helped her better listen to the interviewees as it made it easier for her to differentiate her own thoughts from what the interviewees were saying.

The first author of this paper conducted 33 cognitive mapping interviews in Spring 2017 in order to collect the local actors' reasoning concerning the question of the futures study: "How to create the conditions to increase jobs in sustainable farming respecting agroecological principles in the Grand Causses Regional Natural Park by 2035?". During each interview, the interviewer would first present the question of the futures study, which was written out on a sheet of paper in front of the interviewee so that he or she could have it in mind during the whole interview. The interviewer would then ask them to express their thoughts concerning each part of the question:

- about the question as a whole (to know if they shared the concerns expressed in this question);
- what kind of farming they wished for their area in the future (and their definition of agroecology and sustainable farming);
- which farming-related jobs they wished to see develop in the future in their area;
- which conditions they thought were necessary to increase jobs in sustainable farming and food systems;
- any ideas on how to create these necessary conditions.

During each interview, the interviewee was asked to represent his or her thoughts on a blank sheet of paper, in the form of a cognitive map. The interviewees would either draw it right away to represent their thoughts on the question, and would then be asked to explain what they drew, or we would first carry out the interview and draw a cognitive map at the end,

depending on how comfortable they felt with this representation tool. Each interview led to the construction of a cognitive map, either by the interviewees themselves (in the majority of cases) or by the interviewer, taking dictation from the interviewee. In some cases, the time allocated for the interview was too short to draw the cognitive map, so the interviewer would draw it afterwards and send a copy to the interviewee so that they could validate it or change it.

Before asking the interviewee to build his map, the notion was explained to him by drawing an example of a cognitive map concerning a different domain than the one of our study, to not influence his answers. If the interviewee showed difficulty in completing his cognitive map, he would be stimulated with the following question: “Are there other elements concerning jobs in sustainable farming and food systems?”, or by a reminder of certain elements which he had mentioned during the interview, being careful to repeat the exact words which he had used. No element was imposed in the map, so as to not influence their reasoning. Indeed, to have a cognitive map be closest to the interviewee’s representation, the words and the links between these words have to be formulated spontaneously or in response to open questions (Cossette et Audet, 1992).

Once the interviewee had written the elements which he deemed relevant to the question, he was asked to draw the links between these elements, in the form of arrows. The only imposed rule about the meaning of the arrows was that that the element at the beginning of the arrow influences the element at the end of it. The type of influence was not imposed, to have them express their thoughts as freely as possible and have a cognitive map which best matches their reasoning. The interviewee was asked to explain what type of influence each arrow represented: these were most often links of causality (with a positive or negative influence) and sometimes details concerning the element at the beginning of an arrow.

To finish, the actor would circle with different colors elements which he perceived as:

- the most important
- obstacles/limits
- levers for action
- necessary to increase in the future
- necessary to decrease or change in the future
- strong trends
- uncertainties.

At any given moment during the creation of the cognitive map, the interviewee could modify it. Once finished, the actor was asked to re-read his map and to validate it. A copy of the cognitive map was also sent to him so that he could suggest any modification at any time after the interview.

The duration of the interviews varied from 45 min to 5h, with an average of 2h. We let the interviewees choose the location of the interviews, so that they would be comfortable with the setting. The interviews were conducted in the farmers’ homes and in the other stakeholders’ offices. All the interviews were recorded.

Data analysis

We used both predefined categories and categories defined from the results of the interviews to analyze the cognitive maps and related interview contents.

The predefined categories were (1) the categories of elements circled by the actors (see previous section), which was a way of collecting their own analysis of their reasoning according to this grid, and (2) the domains which are usually considered in the scientific literature about agroecology (Wezel, 2009; Gliessman, 2016):

- Technical (notably farming practices)
- Economic

- Environmental
- Social (including Philosophical)
- Political

The local actors included in their cognitive maps elements which can be attributed to these different domains of agroecology, of which we analyzed the proportion.

The categories which were defined based on the results were subjects which were most discussed by the local actors, such as “human aspects”, “farm transfer”, “education and advisory” and “policy”. This analysis will not be directly presented in this paper.

Here we present an analysis of the elements present in the predefined agroecology domain which was most detailed and deemed important by these actors: the social domain, in which we included the “human aspects” mentioned by these actors.

Results

An unexpected emphasis on human and social aspects in Agroecological Transition

In their cognitive maps answering the question “How to create the conditions to increase jobs in sustainable farming respecting agroecological principles in the Grand Causses Regional Natural Park by 2035?”, the local actors mentioned elements from all the typical domains of Agroecology. In order to understand which elements were most important to the local actors regarding the question, we asked them to circle those elements. Figure 1 represents for each domain the proportion of elements which were circled as most important. Human and social aspects came out as the most important by far, with 58% of elements circled (Fig. 1).

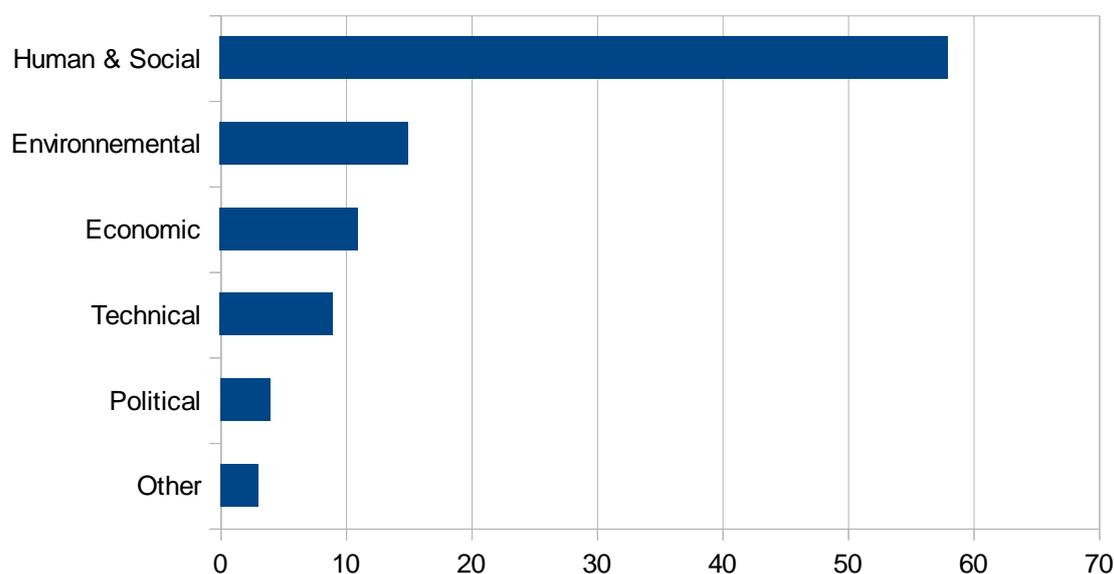


Figure 1: Agroecology domains of elements circled as most important in the local actors’ cognitive maps (in percentage of elements in cognitive maps referring to each domain)

“Social” elements also represented 49% of the total elements mentioned, 38% of the circled “Limits and obstacles”, 46% of the “levers for action”, 54% of the elements “to develop/increase/encourage”, 42% of the elements “to diminish or change”, 30% of the uncertainties and 56% of the “strong trends”.

Human abilities and Social life at the base of agroecological transition

In the “human and social” domain, actors mainly mentioned elements relevant to human skills, social life and human well-being. First, the human skills described were observation, deduction, critical thinking, adaptation, creativity, learning and ability to take risks. Second, the local actors referred to aspects which we include in “social life”, including both internal aspects and external aspects of one’s social life. In the internal aspects we include the following element mentioned by the actors: one’s values (such as respect, solidarity, ethics), personal philosophy (one’s definition of a successful life, one’s paradigm), feelings (security, trust, happiness) and perceptions (identity, awareness, opinions). In the external aspects of social life we include the following element mentioned by the actors: relationships (between colleagues on a farm, farmers and advisors, retiring farmers and farmers taking over the farm, relationship with one’s parents and neighbors during a change of practice...), the capacity of different actors to work together on common projects or to defend common interests (farmers defending their interest as a group, ability to define common values and goals for stakeholders in a given area,...) and connection with “the rest of society” (particularly with consumers). Third, human well-being was described as having good working conditions (preserving one’s health, good relationships with colleagues), good living conditions (being in a nice environment [in Nature], not being isolated, having access to services and leisure), a feeling of accomplishment and sufficient free time for family, friends and leisure.

According to these local actors, we must keep in mind that the basis of the transition to sustainable farming and food systems are the human beings conducting this transition. We thus need to consider them as such: human beings, persons who each have within them different aspects, different needs: professional goals but also personal goals, technical limits and leverages for changing their system, but also emotional limits and leverages. They explain that often the emotional aspect is more important than the technical aspect, as once a person is determined to go in a given direction, they will eventually find a technical solution. One farmer illustrated this principle by describing the way his group of peers manages their “practice and experience exchange” meetings. This group of farmers meets periodically to help each other improve their practices and find solutions to problems they encounter on their farms. At the beginning of these meetings, if they see that someone is not completely present in the meeting, preoccupied by something, they will address that issue first, whatever the issue is (relevant to personal or professional life). This farmer explained this as necessary to get any work done: “If the person is feeling bad, he won’t be able to concentrate well or get any good work done”.

Another farmer and one farm advisor explained how mental and emotional obstacles often hinder change. This farm advisor explained that change of practice is often hindered by fear of other people’s opinion. He explained that taking a week-long vacation in one year, which can increase farmers’ wellbeing, can be a huge challenge on a farm. He illustrated this with the example of a farmer whom he was visiting and who was afraid that his parents (previous owners of the farm and still living close to the farm) would find him lazy if he went on vacation for an entire week. After some discussion with the farm advisor, he realized that his father wants him to be happy and might actually think that taking a vacation would be a good idea. The following year, he went on his first vacation since taking over the farm. This farm advisor explained that farmers will often first mention the practical constraints related to their work, which they say would make it impossible for them to go on vacation. But practical solutions do exist: one can plan a vacation at a time when there is less work on the farm and hire a substitute farmer to take over in their absence. This replacement service is available in these local actors’ area. The advisor explained that farmers will sometimes also mention that they are too attached to their animals and would not trust a substitute in their care. The advisor concluded that most often there is also an underlying emotional issue blocking change, which needs some discussion to bring to the surface.

The above mentioned example concerns a well-being “practice”, but could just as well concern a farming practice, not daring to change for fear of what the parents or peers will think. For instance, farmers and advisors both noted the “cohabitation” of retired farmers and

the vicious cycle of grow or die”, which leads to over-investing, debt, over-insuring (against any risk) and a loss of independence. This paradigm entails a psychological aspect: farmers think the bigger their farm is, and the bigger their truck is, the better farmer they are. Down-scaling their farm thus requires a paradigm change, which is not trivial.

Another psychological aspect contributing to farm size increase is that farmers often prefer to sell their farm to people they know: if their kids don't take over, they often prefer to sell their farm to their neighbor, thus increasing the size of his farm, rather than selling it to a stranger. Their farm is their life's work, making it hard to let go. Moreover, farmers usually have their house in the middle of their farm and do not wish to move out of their house, as they have lived there most of their life if not their whole life. This makes them even more inclined to sell to a neighbor and stay in their house rather than to an “outsider” and have to “cohabitate” or move.

Another issue is that farmers often don't anticipate the transfer of their farms, which makes finding a good successor harder. And even when they are willing to sell their farm to an “outsider”, they face other difficulties: the cost of the farm, the farmer's job's poor attractiveness (because of the working conditions or society's negative image of farming in general), isolation of the farm from other human beings and public and private services (schools, medical facilities, plumbing, shops, bakeries, etc.), and, last but not least, a bad welcome of outsiders from the locals, which can easily discourage any good suitor. Moreover, social isolation and farm cost increase with the size of the farm. The only people capable of buying a big farm are often farmers which already have a big farm and a big investment capacity, which quickly creates a vicious cycle. Inheritance is now often the only way to “get started” on a big farm, which outsiders do not benefit from. All these reasons contribute to the fact that it is easier to sell the farm to a neighbor, who will increase the size of his farm, rather than to a new farmer who will maintain the existing structure.

Social levers to maintain human-scale farms

One lever to maintain human-scale farming is collaboration between farmers. Indeed, as explained by a national park manager (Fig. 3), farmers in “human-scale” farms do not have the need or wish or capacity to own certain pieces of expensive equipment. So if they want to use such equipment, they need to share equipment, infrastructure (“collective tools” in Fig. 4), and thus organize themselves as a group (“social link” in Fig. 4).

Some of the levers described were linked to internal aspects of social life: one farmer noted as a lever “redefine one's definition of success”, “fight against the unlimited growth myth and the vicious cycle of grow or disappear”. He also noted “Fight against the techno-solution myth” and “Paradigm change” as levers to “exit the unlimited growth ethic”.

Other social levers described by farmers and advisors concerned the facilitation of farm transfer, such as anticipating farm transfer, making the farmer's job more attractive and welcoming “outsiders”.

Importance of residing in a “lively area” for farmers’ well-being

One of the most highlighted “social” aspect was the notion of a “lively area”, meaning being in an area with economic, social and cultural activities, well-maintained infrastructure and access to public and private services (schools, medical facilities, shops, etc.). The actors noted that maintaining a “lively” area requires maintaining a certain number of jobs in the area. They described that once an area starts lacking good infrastructure, services and socio-cultural activities, people (including farmers, and also bakers, shop owners, doctors...) are less inclined to reside there, and in turn the remaining services and activities start lacking clients or participants, and thus a vicious cycle starts. According to these local actors, as their area is very agriculture-oriented, maintaining a sufficient amount of farmers is crucial to maintaining their area “lively”. Many farmers, farm advisors and the natural park manager explained the influence of farm size on the liveliness of an area: when farm size increases, most often the total number of farmers decreases. They explained that this has a negative impact of farmers’ social life with their peers and contributes to rural desertification.

Farmers and advisors also noted that with more people living in their area, farmers are more likely to have a direct link with consumers, which facilitates direct selling and communication with the rest of society. Having a sufficient amount of activities in the area also influences another important and common issue for farmers: their spouses are more likely to find a job and stay with them.

Human support in farm advisory and education, an important “social” lever for Agroecological transition

Several farm advisors and farmers described a new kind of farm advisory, separating from the mainstream top-down approach where advisors pass knowledge on to farmers and tell them what should be done. Many farm advisors are now developing a “thought support” approach, where they encourage farmers to use their own knowledge, by helping them to ask the right questions. They also organize knowledge and experience exchanges between farmers. One farmer said that he would like farm advisors to stop using references and averages to compare farms altogether, as he notices that “averages” are rarely adapted to individual situations. He prefers an approach focused on the specificities of each farm and each farmer, according to their own knowledge, capacities, opinions and goals. He pointed out that giving advice is not easy as everybody has their own knowledge, skills, opinions and influence network.

Several farm advisors and farmers talked about the importance of integrating personal development in farming support. They mentioned the importance of certain psychological aspects such as fear of failure and fear of uncertainty, which could benefit from coaching. One farmer highlighted the importance of being able to make mistakes without being afraid of the process of failure, but rather taking it as a learning opportunity. He explained that if one wants to try new things, which is especially true in agroecological transition, one needs to know how to handle trial and error. Concerning uncertainty management, most farmers use insurance to cover risks, and some note a tendency to “over-insurance”, which a lot of interviewed farmers judged as being counter-productive. They think that it would be necessary to learn how to manage uncertainty differently. Several actors talked about a farming advisor, who unfortunately passed away a few years ago, who would coach farmers and advisors about using personal development tools (such as neuro-linguistic programming) in order to help them achieve their goals by overcoming mental and emotional obstacles. The local actors think that this aspect is now missing, as a lot of obstacles and levers for change are emotional and mental. For instance, several people mentioned the importance of reflecting on the value of work and its place in life, to be able to create a balanced life for oneself. Several farmers and advisors also mentioned the importance of questioning one’s definition of success and to set goals which are compatible with one’s true life goals. These actors stated that this alignment between farm success and life goals was not always present in their practice, but several have achieved a satisfactory alignment. They notably noted the importance of working in a way that is consistent with their personal values. One vegetable

farmer mentioned that his work does not bring him a lot of money, but that this is not his main goal. He makes enough money to live and doesn't see his work as "just a job", but as a satisfactory way of life, in nature, at his own rhythm.

Several farmers and farm advisors highlighted the importance of communication and relationship management, in particular when working in a group and during a farm transfer. All the farmers who work with farm associates or employees emphasized the importance of having a good communication, starting with keeping everybody informed of what they see and do, making decisions together and letting people know right away if they have a problem with what somebody else is doing. Several farm advisors thus indicated that including a training in communication in farming schools and in ongoing education would be very useful to improve farmers' well-being and farm management.

Several farm advisors and farmers also noted the importance of opening farmers' minds to other life situations, so that they become aware of the possibilities that they have and of the quality of life that they have. Indeed, some farm advisors are weary of hearing farmers complain and feel helpless, when, from an advisor's point of view, they see many possibilities: they are their own boss, they could sell their farm and use the money to start a business if they wanted to, etc. To help farmers understand other life and work situations, one farm advisor suggested the organization of exchanges between farmlands and a big city with traffic jams and little nature. Another one suggested an exchange with small restaurant owners who invest their own money in their project and contrary to farmers get no subsidies from the state, but face a lot of uncertainties, notably the flow of clients, impacting their stock management. These advisors would like to bring more awareness to these farmers, to make them realize "they are still the ones with the most power to make decisions on their farms". Several advisors also said that having so much responsibility actually scares some farmers and note that a training in entrepreneurship and company management should be integrated in their education.

A lever to reconnect farmers and the rest of society: more two-way human-to-human communication

Most farmers interviewed feel like "society does not understand them anymore" and farmers and advisors point out that farmers need to adapt to consumers' demands. Several actors mentioned the need for communication between farmers and consumers, so that consumers better understand food production, ecological balances, possibilities and limits of farming production and so that farmers better understand the evolutions and expectations of consumers and society, notably how food trends/diets/consumption is evolving and also how life styles in general are evolving. They cited direct selling (to individual consumers, canteens or restaurants) and agrotourism as levers for this reconnection.

Discussion

An unexpected emphasis on human dimensions - Comparison with other approaches of Agroecology

Contrary to the mainstream opinion of technicians and researchers, according to which one needs to speak of technical aspects to farmers for them to be interested, most of what the interviewees chose to talk about were aspects other than technical, but mostly related to human and social aspects, which have a big impact on farm and food system management. Moreover, when they talked about practices, they mostly talked about how they use them: with critical thinking, adapting to their situation, respecting the animals, observing the results and adjusting, etc., thus emphasizing certain human skills rather than the techniques themselves.

Concerning the "social" pillar of sustainability and agroecology, most of what is usually considered in research and policy concerns working conditions (working hours and

arduousness), access to food (Allen, 1991), fairness of farmers' income (D'Annolfoa, 2015) and more recently the link to the consumer and the impact of the type of food production on health. Studies of agroecology in South America have also emphasized the importance of farmers' empowerment and family farming (Altieri, 2011). Ryschawy (2015) showed that being involved in a network of appropriate stakeholders has a key lever for agroecological transition. Beudou *et al.* (2017) have recently shown that cultural and territorial vitality services can play a key role in livestock agroecological transition in France. From the contributive justice point of view, Timmermann (2015) explains how agroecology offers the opportunity of “[providing] meaningful work through a fairer distribution of attractive and tedious tasks”, as agroecology favors the development of human capabilities (Nussbaum, 1997), which is “a very important factor in making work meaningful”. Timmermann defends the idea that a more labor-intensive form of agriculture such as agroecology would be beneficial for society thanks to the creation of interesting and balanced jobs.

Even though some studies highlight specific aspects of social dimensions, the obstacles and levers to agroecological transition which are most put forward by research, advisory and policy are still technical and organizational issues (Duru *et al.* 2015; Ryschawy *et al.* 2015; Migliorini, 2017) and research orientations tend to neglect the social dimension of agroecology that is particularly important for European livestock (Oteros-Rozas *et al.* 2014; Rodríguez-Ortega *et al.* 2014).

A need to further integrate human and social dimensions in Agroecology

The results in this study show that agroecology's implementation depends on human motivations and skills, as well as social interactions. In the “social” pillar, we need to take into account, preserve and encourage human skills and a beneficial social life, both internal and external, for the local actors. Indeed, the results show that whatever the practice used, it is essential that the stakeholders adapt it to their situation by using observation, critical thinking, trial and error, etc. These skills should thus be encouraged and supported in farm education and advisory. Developing a new kind of advisory, encouraging the use of farmers' knowledge and taking into account each situation's specificities, appears as one major lever to undertake an agroecological transition. From the present results, integrating personal development in farm advisory also appears as a major lever as the mental and emotional aspects are often described as more important than the technical aspects. The actors interviewed explained that once a person is determined and confident to go in a given direction, they will eventually find a technical solution, whereas having a technical solution without having the will to implement it does not lead to change. A possible approach for agroecological transition is thus to make sure the human beings are ready to change before thinking of practical solutions. Moreover, as described by the local stakeholders, integrating communication courses in general education and farm advisory would facilitate group dynamics and the defense of all stakeholders' interests. And, last but not least, as noted by the actors, participating in collective projects impact the stakeholders' capacity to evolve together and create a consistent dynamic for farming and food systems in a given area. According to the local actors, encouraging the development of such networks, notably with dedicated funding, is also a considerable lever for agroecological transition.

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