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Hélène Brives, Pauline Rioussset, Stephane de Tourdonnet

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- Conservation Agriculture is shaped through advisory schemes

author name(s): H el ene Brives¹, Pauline Rioussset², St ephane de Tourdonnet³

author affiliations

¹ AgroParisTech, 16 rue Claude Bernard, 75230 Paris cedex 05 (France)

² Free University Berlin (Germany), Environmental Policy Research Center

³ SupAgro / INRA UMR Innovation and Development in Agriculture and the Agrifood Sector 2 place Viala 34060 Montpellier cedex (France)

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Abstract: This communication challenges the idea that participatory extension methods are required to develop more sustainable forms of agriculture. It is based on a comparison of two case studies presenting how Conservation Agriculture is promoted by a French agribusiness company. In one case a participatory extension scheme is organized when in the second case CA is promoted through technology transfer. The paper explores how do CA practices evolve when developed through participatory and non participatory methods. The main conclusion of the research is that contrasted farming practices are extended under the Conservation Agriculture label and that these farming practices are shaped by the extension methods. Farming practices extended through more participatory extension methods seem to be more sustainable than the others because participation stimulates farmers' learning and adaptability but also in terms of agronomic techniques.

1. Introduction

The study of extension process and extension methods is necessary to stimulate the transition to more sustainable forms of agriculture, and to imagine most appropriate way to do so (Warner 2008, Koutsouris 2008, Klerkx and Jansen, 2010). A review of international literature on extension shows how "top-down methods" based on a "transfer of technology" concept have been disqualified in aid of participatory methods (Faure, Desjeux and Gasselin 2011, R oling and Groot 1998, Ponniah, Davis, Sindu, 2007). The evolution of advisors activities and skills is at stake (R emy, Brives and L emery, 2006). More participatory methods challenge interactions between farmers and advisors and interactions between scientific knowledge and farmers' indigenous knowledge (Chambers 1990). R oling and Jong (1998) emphasize farmers learning process and a facilitative role for advisors

Agroecology theoreticians argue that agroecology cannot be transferred like technology but requires alternative extension practices through participatory networks. According to Warner (2008), "*Agroecology (...) can only be successful as a participatory science*".

Similarly for Uphoff (2002) projects which did not take farmer participation into account were proved to be unsustainable. In France, promoters of “conservation agriculture”¹ (CA), which sometimes overlaps agroecology, stand on the same position criticizing scientific laboratory methods and extension services expertise. As local ecological knowledge of farmers becomes valuable, participatory approaches are favoured to stimulate the active role of farmers in the production of knowledge.

This communication challenges this link between participatory methods and sustainable agriculture. When questioning the best way to promote more sustainable agricultural practices, these practices are supposed to be well known and defined. We would like to turn the question round: How do CA practices evolve when implemented through participatory and non participatory methods?

This paper contributes to answering the following research questions:

i) In a context of increasing privatization of extension services, agribusiness firms play a major role in the extension of “conservation agriculture” (Labarthe 2009, Goulet 2008). What are private bodies’ extension strategies to promote CA? Are participatory methods able to fit agribusiness plans and how do extension methods frame interactions between farmers and advisors?

ii) What consequences do participatory and non participatory methods have on the evolution of farming systems and farmers’ learning process?

iii) What are the techniques extended under the label “conservation agriculture” (CA) depending on contrasted extension methods?

We use the Actor Network Theory (Akrich, 1989; Callon, 1986) and its developments (Latour, 1988) as a theoretical framework to explore symmetrically the changes in, the agroecosystems and in the social relations organized around them. The ANT allows us to consider an extension scheme as an evolving network linking people, natural objects (like plants or pests) and artefacts (such as fertilizers or a seeder). It gives a holistic understanding to innovation. Natural objects and artefacts are part of the social interactions as well as people. Some of them can play a major role in framing interactions between farmers and advisors. We use the notion of “attachment” (Latour, 2000) to examine the predominant bounds within the sociotechnical network. Attachments bounds humans and non humans, people and objects together in socio-technical networks and make them act.

The drop out of plough from the sociotechnical network as a first step of transition towards CA practices, generates a reconfiguration of the sociotechnical actor network. Roles are redistributed among soil, plants, people and technical artefacts (Goulet, 2008).

¹ The FAO definition of CA is as follow: *Conservation agriculture (CA) aims to achieve sustainable and profitable agriculture and subsequently aims at improved livelihoods of farmers through the application of the three CA principles: minimal soil disturbance, permanent soil cover and crop rotations.*

Our hypothesis is that extension methods contribute to the reconstruction of socio-technical networks: the advisory scheme is able to change the attachments, that is to say the predominant bounds that make farmers act and the role of the different actors in the network. The ANT considers innovation as a process. Thus, in our analyze, we will pay attention to the evolutions of actors (human and non human) and to learning process. We will follow how advisors, while organizing the collective action around CA, will frame the network that is to say will exclude actors (human and non human) or on the contrary will accept the construction of new links in the network. Callon (1998) use the words "framing/overflowing" to point out the control the socio-technical borders.

2. Methodology

This research is based on a field work within a French cooperative which defines its business strategy in terms of sustainable development and "ecological intensification." Conservation agriculture is a textbook example of the approach. In this cooperative situated in eastern France, two advisors, both equally eager to promote conservation agriculture, developed contrasted methods for the promotion of CA: the first one provides instructions on conservation agriculture while the other organizes a group of farmers meeting periodically to exchange on CA experiences. These two cases are quite distant: the first one is located in Champagne and the second one in Franche-Comté. The advisors working areas are 250km distant and they only meet about once a year for a meeting at the head office.

The research relies on a comparative analysis of these two contrasted advisory schemes.

The material used in this work is of several origins:

- Ethnographic observations of interactions between each advisor and farmers, either face to face or in collective situations (two full days of participative interactions and two full days of following the advisor 2 in his visits to farmers (1,5 day) and presentations to potential future adherents of his methods (half a day))
- Comprehensive interviews (Kaufmann 2007) with 20 farmers (10 in each group) and 3 to 4 interviews with each advisor.

In both cases two elements have been analyzed to answer the research questions:

- the organization of advisory schemes in terms of content of advices (artefacts, natural objects and agronomical practices involved), of the role of advisor and the interactions between farmers and between farmers and advisor.
- farmers' trajectories towards CA and farmers' ways of learning.

3. Results

3.1 Agribusiness use participatory as well as non participatory methods to extend Conservation Agriculture

The Franche-Comté advisor can be described as a classical cooperative salesman able to advise on anything from the application of pesticides and fertilizers to the trade of agricultural products on international markets. His commercial argument relies on competitive crop management techniques supposed to use less input (fertilizer, pesticide, water, petrol) than conventional crop management ones.

This economical management is based on three rules: massive input of manure, massive lime enrichment and zero tillage (or direct seeding). Therefore CA advice is included in a kind of “package of advice” promoted as a way for farmers to save money. Here the commercial strategy is to enlarge and keep the clientele through CA expertise, to gain market shares rather than increasing the sales per farm.

These prescriptions, which proved to be successful in a number of farms in the area, seem attractive enough to numerous farmers to risk direct seeding.

The Franche-Comté advisor sees himself as an expert giving detailed instructions in face to face interactions with farmers. He acts as an agronomist at the service of the farmers. He is permanently checking pest invasion, weather and market trends in order to advise farmers and provide them with the latest information.

Interactions with farmers are mostly one-to-one relationships. The advisor acts both as friend and a salesman reemphasizing at any occasion the benefits of direct seeding compared to other techniques (reduced tillage, organic farming, conventional farming...), and creating dissociations regarding these other communities. The advisor acts also as a teacher in repeating again and over again the principles of CA “until the farmer repeats the principles himself”.

Farmers are encouraged to call the advisor whenever they have a question, what they do. The advisor needs absolute trust from his clients because he expects them to strictly follow his prescriptions. This is an essential condition for success he said. Under this condition, the advisor assures the farmer that he assumes the risk which comes along with shifting to direct seeding. This is the reason why there is no room to discuss the principles or the prescriptions.

The second advisor, in Champagne, organizes a network of participatory social learning –so called a club. The club includes about 70 farmers who voluntarily joined to benefit from the activities organized around conservation agriculture. The activities of the club are not directly connected to a commercial policy even if the club provides an attractive window for the cooperative. The club is also organized as a lab to test ways of implementing CA. The advisor only targets conservation agriculture. Therefore the CA

advisory scheme is disconnected from input sales activities or any other advisory services of the firm.

The advisor does not have any ready-made recipes to propose to the farmers. He insists on learning and on transmitting rules of decision to farmers. He questions farmers to make them reflect on their practices. He sees himself as a coordinator and a peer among the farmers. He does not expect farmers to follow instructions but to exchange their experiences on CA. He never says himself what is best. He always refers to the group and to the experiences of the members of the club. He organizes meetings to promote exchange of experiences among the members of the club, annual trips to other farms in France or abroad and sometimes interventions of scientists. He sheds light on model cases and experiences in order to collectively produce rules of decision rather than solutions themselves. He believes that everyone has to make his/her own experience and find his/her own way in CA. The members of the club are encouraged to research specific topics and to formalize the experiences they make on field to bring the results back to the group. The advisor tackles any emerging controversy in organizing discussions within the group. Farmers are said to be more or less advanced in the learning process. Therefore interactions with farmers are rather collective than face to face. The advisor organizes meetings on farms of people who test something new or have a specific problem.

The case of Franche-Comté shows very strong attachments of farmers to the prescriptions of the advisor and even more to the advisor himself who has no competitor with CA expertise in the area. The advisor can take the risk of shifting to direct seeding as long as farmers strictly follow his prescriptions. If farmers move out the recommended way, the advisor can no longer ensure the farming success. Consequently, opportunities of trials as a way of learning are scarce. This attachment seems risky: some farmers show their attachment to the advisor saying “what will we do when you are gone?”. The advisor himself explains that some farmers in the area are eager to shift to CA but prefer not to rather than been tied up to the advisor. In the Champagne case, farmers' involvement in CA relies on learning (inside and outside the group, collective learning and individual learning through trial/error process). Here the advisor is not an obligatory passage but learning is.

3.2 Participatory advisory scheme furthers farmers' learning and enlarges the diversity of farming systems in CA

The advisory scheme of Franche-Comté is somehow very efficient in making all farmers switch rapidly from ploughing to direct seeding. On the contrary in the club, farmers move step by step to reduced tillage and sometimes only to direct seeding. This long term process is presented, by farmers as well as the advisor, as a learning process. The club is said to be a learning community and a breeding-ground for diverse alternative ways to manage farming systems in CA. Farmers, who very often define themselves as researchers, develop an attachment to this ever-going process of learning.

In case of “a crisis” or a significant evolution of the network (for example the advisor stops his activity or herbicides are forbidden) how would the Franche-Comté CA farming systems evolve? It seems that strong attachments or reliance on both herbicides and advisor, weaken the systems. This kind of advisory scheme does not give opportunities for farmers to experiment alternative practices nor to find alternative sources of information. Farmers here seem to be locked into a system. It is symptomatic that expectations for genetically modified seeds are much greater in this situation than within farmers of the club.

In the Champagne case, if practices need to evolve drastically (to adapt to climate change for instance or to suit a new legislation), there already exists a large number of alternative paths within the group and farmers are trained to experiment, exchange ideas and look for information. This kind of advisory scheme based on farmers’ participation seems to lead to more flexible and resilient farming systems in CA.

Farmers and advisors, when questioned on CA, very often develop the idea that to convert to CA “one’s has to believe in”. The advisor of the club says that “to believe in” means for a farmer to find a solution “which he feels comfortable with and which lets him sleep well”. The advisor in Franche-Comté wants farmers “to believe in” his advice so that they strictly respect his prescriptions leaving no room for uncertainty.

3.3 Very different practices are developed under the CA label

The content of the advice provided and farming practices are considerably different from a case study to the other although both advisors claim to promote CA. The CA label, defined under three principles (minimal soil disturbance, permanent soil cover and crop rotations) by the Food and Agriculture Organization, is used to refer to agriculture trying to valorise ecological processes as well as genetically modified corn or soja monoculture. Therefore it seems important, in terms of sustainability, to understand what kinds of techniques are implemented under CA.

In conventional systems, ploughing has two functions: 1) it allows to structure the soil and to bring fertilizing elements to the surface, 2) it allows to weed efficiently the field before seeding. Abandoning the plough leads to replace its functions by other objects (natural objects or artefacts) (Goulet 2008). From our case studies, it came out that advisors are the key actors of the organization of this replacement.

In the first case, in Franche-Comté, only direct seeding is recommended: reduced tillage is presented as worse than ploughing in the local agronomic conditions. The function of structuring the soil is entirely delegated to earth worms.

In the club in Champagne, the advisor does not recommend any best way towards CA. The plough is replaced by a variety of reduced tillage practices (including direct seeding for a minority) and the use of cover crops. Earth worms are recognized to be very important to structure the soil but together with cover crops. Cover crops are the key new actor of the network as they can play different interesting roles: structuring the soil,

offering “room and board” to earth worms, providing organic matter, competing with weeds, preventing erosion, water pollution etc.

The Franche-Comté advisor knows about cover crops potential benefits and reports his experiments on his own farm. He knows also how tricky is the implementation of cover crops, how difficult it is to control their role in the network. The expected benefits are not always reached. This is the reason why his prescriptions exclude cover crops. Cover crops have a too risky behaviour to be part of a fully insured farming solution.

The second function of plough, weeds control is also contrasted.

Exclusive direct seeding in Franche Comté does not give any other choice than relying entirely on herbicides to weed the fields. Farmers of the club have a panel of weeding methods: they use cover crops together with longer rotations, reduced tillage tools and herbicides. Farmers have to decide what is best for them under the soil and meteorological conditions and what they prefer for their system. Unfortunately, such a qualitative approach does not permit to evaluate rigorously whether they use less or more herbicides than in their previous conventional system.

In both cases farmers start to get rid of the plough and to pay great attention to what they call “soil life”. “Soil life” means involves earth worms in both cases but brings in a new actor, cover crops, in the club.

Because of their uncertain behaviour, cover crops are excluded from advices in Franche-Comté. Zero tillage forbids any mechanical solutions to control weeds. Therefore, in the Franche-Comté case, farming systems in CA rely on chemical solutions, herbicides.

4. Conclusions

This research shows that very different practices are extended under the Conservation Agriculture label. CA extended in a prescriptive way leads, in our case, to a standardised model of implementation (direct seeding and herbicides) under the control of the advisor. On the contrary, participatory advisory schemes leads to extended socio-technical networks and not only because farmers can play an active role. Participation also allows to build bounds with actors of non predictable behaviour (like cover crops). Farmers' ways of learning, very much based on experimentation, are stimulated. Trial and error processes are legitimate. In consequence, farmers learn to deal with uncertainty. In the case where the advisor ensures his advice, uncertainty and non predictable actors must

be excluded from the network. On the contrary, if the advisor does not see himself as the expert and leave to the farmers the responsibility of their choices, then the door is open for alternative experts, expertises and controversies.

Therefore our research reasserts the link made by Warner (2008) or Uphoff (2002) between more sustainable agriculture and participatory extension methods. Through non participatory methods, the sustainability of CA farming systems can be questioned because of the practices extended but also because farmers' learning and adaptability are not stimulated. As Klerkx and Jansen (2010) show, development of a more sustainable agriculture cannot rely only on private bodies.

In a context of rapidly changing environment, it is crucial that farmers develop capacities of adaptation. They need to be able to adapt to changing regulation, to changing environment and use new forms of practices (cover crops for example). Conservation agriculture as well as agroecology are usually taken as model examples of practices which can only be developed through participative extension methods favouring farmers' learning. However, this research demonstrates that this is not necessarily the case. Moreover, private companies may prefer to develop the more secure version A for their clients (as was clear during our talks with the governing board). In such a case, there will be limited learning of adaptation skills of farmers, which is a risk for the farming systems.

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