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AN INNOVATIVE CO-DESIGN PROCESS TO EXPLORE DISRUPTIVE CREEPING THISTLE MANAGEMENT STRATEGIES SUITED TO LOCAL ISSUES

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Abstract:

Disruptive innovation is needed to support organic agriculture, i.e. to think out of 'conventional agriculture' and to build innovative cropping systems suited to local issues. Indeed, it involves finding new way to work with these stakeholders while creating new cropping systems. This innovation process is particularly difficult when scientific knowledge is missing. This paper describes the implementation of an approach combining tracking on-farm innovations and co-design workshops to manage creeping thistle in arable organic farms in the Northern France context. A wide range of useful results for farmers and advisors has been produced (e.g. knowledge on innovative practices and on their combinations). Some key points are highlighted for the implementation of such approach, particularly, diversifying sources and type of knowledge to help stakeholders be disruptive.

Introduction: Building organic cropping systems (OCS) suited to local conditions is key for their sustainability. Recent researches shed light on innovative processes to design systems involving farmers and other stakeholders, such as co-design workshops (Meynard et al., 2012) and tracking on-farm innovations (Salembier et al., 2016). Few studies have combined both, although they can be complementary to support OCS design. This article shows how these approaches were used in an innovative design process on the case of creeping thistle control in OCS. Indeed, managing creeping thistle is tricky in Northern France because of difficulties to implement mown alfalfa (the most efficient practice to control this weed) and of a lack of knowledge on other control practices (Favrelière et al; submitted). Our hypothesis is that to build organic cropping systems to manage thistle, disruptive innovation (management practices, combination of practices and decision rules) is needed. To do so, we assume that innovative ways to support innovation toward OCS is necessary.

Material and methods:

Producing relevant knowledge for the co-design process

Our study takes place in the frame of a participatory project in Northern France aiming to produce knowledge and innovative solutions on OCS without alfalfa to control creeping thistle.

To support farmers and advisors in the design of innovative systems, different types of knowledge are needed (Prost et al., 2018): (1) knowledge on biological processes and (2) knowledge on management practices. We used C-K modelling (Hatchuel and Weil, 2009) to inventory and organize available knowledge. Our analysis pointed out that existing knowledge mainly focuses on soil tillage and on competition with alfalfa. To build innovative systems, knowledge on other management practices, such as competition with other crops than alfalfa, as well as knowledge on the effect of practices combination are needed. We used the tracking on-farm innovation method (Salembier et al., 2016) to broaden the range of available knowledge and contribute to fill the identified gaps. This approach consists in (1) exploring new networks to identify farmers that manage successfully thistle in OCS (2) characterizing their practices and decision rules through interviews (3) analysing their practices regarding to available literature and 4. highlighting lessons from those experiences.

Organizing co-design workshops

We organized several co-design workshops, involving farmers and advisors, to explore innovative systems suited to local issues. Previous studies (Meynard et al., 2012) have pointed out key elements for the success of these, and among them involving different types of stakeholders: (i) voluntary farmers with more or less experience in organic farming, implementing different management practices and having different production system; (ii) advisors already working or not with these farmers. The workshops were led by 2 to 3 meeting facilitators and an expert to share available knowledge. 3 local groups of 4 to 12 farmers and 2 advisors were formed to fit to the diversity of local production contexts and to make it easy for farmers to participate. A set of 3 workshops were organised within the frame of the “KCP workshops” (Elmquist and Segrestin, 2009). They aimed at sharing existing knowledge from literature and on-farm innovations with stakeholders (K stage), and then at collectively imagining innovative systems (C stage). Produced knowledge was synthetized in relevant support tools identified and tested during the workshops (P stage).

Results:

Knowledge synthesized before the co-design workshops

Available knowledge on creeping thistle development cycle and on its root reserves dynamic has been formalized so as stakeholders were able to identify key periods to implement management practices and underlying mechanisms. Scientific literature and available knowledge on tested practices has also been synthetized, and key points to guarantee their efficiency regarding to biological processes were highlighted (Favrelière et al.; submitted). As an example, the 6-8 leaves stage has been identified as a key period for soil tillage. Complementary knowledge from on-farm innovation tracking were used to widen the range of available management practices: combination of management practices (e.g. temporary grassland with clover x ploughing x hoeing) and underlying decision rules (e.g. if thistle, temporary grassland; if not cash crop and hoeing), competition with sainfoin rather than alfalfa, unknown management practices for the group, such as biodynamy, etc.

Knowledge produced during the overall co-design process

Table 1 illustrates results obtained during on-farm innovation tracking and co-design workshops : (1) knowledge on control practices or on combinations of practices, which was lacking at the beginning of the process; (2) knowledge on decision rules to implement these practices or combinations of practices; (3) knowledge on how to structure useful support tools for stakeholders. These results open new avenues and enrich the state of the art, compared to management practices that were implemented in our area (e.g. managing thistle with cover crops instead of mechanical interventions).

This approach also pointed out some lack of knowledge to be addressed to researchers: can differences in management practices between fields be linked to genetic differences between creeping thistle populations? How could biological control methods be implemented on creeping thistle? What processes explain the efficiency of biodynamic strategies?

Table 1: useful knowledge for creeping thistle control produced during the innovative co-design process (on-farm innovation tracking and co-design workshops)

	Examples
(1) Knowledge on innovative management practices or combination of practices, ready to use or to be tested	- Competitive species alternative to alfalfa (sweet clover, sainfoin) and their expected characteristics: growing period, growth rate, competitivity - Permanent or semi-permanent soil cover and inter-row mowing
(2) Knowledge on decision rules to implement those practices or combination of practices	- Relevant management practices depending on creeping thistle density (soil covering at low densities/mechanical interventions at high densities) - Key elements for implementing mechanical interventions depending on climate and creeping thistle development
(3) Knowledge on how those references can be put in form to be useful	- A calendar synthetizing relevant intervention periods depending on cultivated crops - Examples of pluriannual control strategies with relevant decision rules on crop succession and control practices

Designing local cropping system for creeping thistle control

Innovative OCS suited to local conditions were designed during the last workshop using the knowledge produced by the two previous workshops, such as OCS aiming at semi-permanent soil cover, OCS using the described decision rules to better manage creeping thistle in different context (vegetable production and arable crop production for example).

Discussion: Combining on-farm innovation tracking and co-design workshops was relevant to build innovative creeping thistle control systems suited to Northern France. Those systems must now be tested to evaluate their accuracy and efficacy.

The process helped stakeholders to get out of the box (i.e. to explore original OCS) and to produce knowledge on combinations of practices, which was lacking. It also allowed us to formalise a guide to help building cropping systems to manage creeping thistle for a wider range of advisors and farmers (available on http://www.agro-transfert-rt.org/projets/vivlebio/).

Some key points must be followed to implement this approach, and above all diversifying the types of knowledge (biological processes, examples of innovative control practices) and their origins (e.g. scientific and on-farm knowledge). C-K modelling and on-farm innovation tracking played a major role for this. It emphasizes the need to combine disciplines: C-K modelling comes from management sciences, such collaborations should be further developed to support innovative cropping systems fitted to current challenges.

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