Structuring and guiding knowledge exchange within the organic farming sector in Flanders: A transdisciplinary and system approach

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Introduction

Decision making and strategy design on organic farms requires a broad insight and understanding of the farming system. However, supportive knowledge exchange faces specific fundamental problems in the case of Flanders. First, gathering farm specific data and knowledge is limited due to the small number of farms within each agricultural sector. Second, the diversity of organic farms causes difficulties in comparing these individual data. Moreover, as processes on organic farms are often more interrelated and less controlled than on conventional ones, strategy design at farm level needs to account for this specificity and complexity. These problems call for new ways of structuring farming system knowledge for strategy design and strategic choices. In Flanders, farmers and advisors from the organic farmer networks requested facilitation of their knowledge exchange to tackle these issues. Literature provides two key issues in overcoming these problems. First, a system approach delivers tools to understand the complex interactions within and between farming systems (Darnhofer *et al*., 2012). Second, a transdisciplinary co-production of knowledge is recommended and includes societal actors in the knowledge co-production process (Aeberhard & Rist, 2009). Such an approach should be able to assemble the needed expert and tacit knowledge from different stakeholder groups (farmers, advisors, farm networks, research and educational institutions). As a result, this paper aims to contribute to the aforementioned shortcomings by describing a transdisciplinary and system approach to structure knowledge exchange in organic farming.

Methodological approach

We define the transdisciplinary co-production of knowledge as the collection and analysis of information on the organic farming system involving scientists, farmers, advisors, farm network representatives and educational institutions in all phases of the research process (De Ridder *et al*., 2007) to set up a learning process that encourages implementation of the outcomes. During the transdisciplinary process, we searched for techniques that include system thinking and explored both quantitative and qualitative techniques because a mixed methods approach can provide strengths that offset the weaknesses of each type of research (Creswell & Clark, 2011). Using both numbers and words, combining inductive and deductive thinking, is highly suitable for solving complex problems. The combination of these techniques resulted in a framework (Fig. 1) that is able to structure knowledge gathering on organic farming leading towards a better understanding of the complex organic farming system. Since each agricultural sector is characterized by a specific context, farming practices, and network, we set up three different processes within the following sectors: beef cattle, dairy cattle, production of arable crops and vegetables. Although the 3 processes were implemented simultaneously and differed substantially, we could distinguish three main phases (P1-P3) adding to an overall and generally valid framework (Fig. 1). Throughout

a first phase (P1), key management features for successful organic farming are captured during organic network meetings, through observations and participation in discussion groups with farmers making use of mainly qualitative techniques (coding of observations and interview notes). Second (P2), a farm scan is developed and used to structure both quantitative and qualitative information on these key features in a collaboration between advisors, experts and researchers (Bijttebier et al., 2015). In a third phase (P3), the focus is on defining the interactions and trade-offs between the key features by use of both qualitative (e.g. cognitive mapping) and quantitative techniques (e.g. farm modelling).

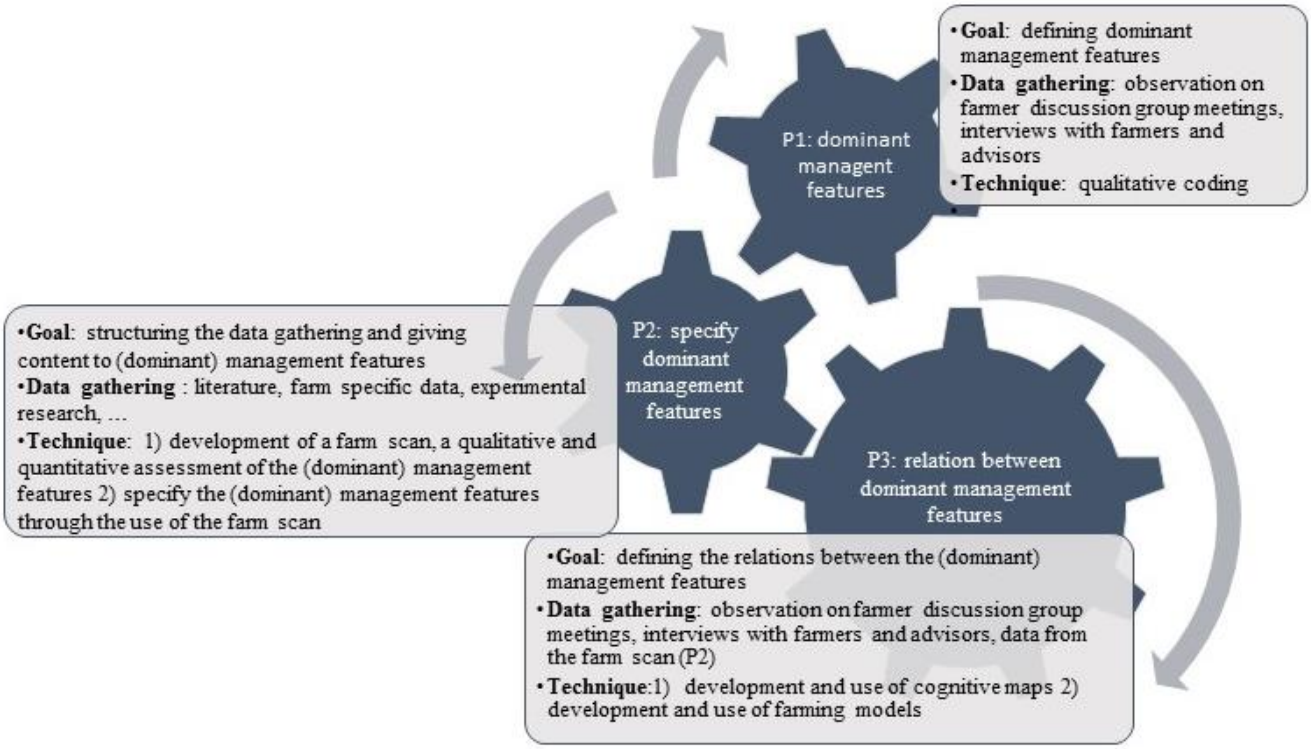

Fig. 1. Overall framework to structure knowledge gathering on organic farming systems.

Results – Discussion

The implementation of the framework during the network meetings of the three production systems (beef cattle, dairy cattle, arable crops and vegetables) revealed important issues (Table 1) with respect to the effectiveness of the process, the series and timing of the phases and convergent attention points. First, depending on the identity of the initiators, the initial problem definition by the stakeholders and the involvement of the farmers, the course of the process is very different. Within each sector, the phases were carried out not through a linear process and not even an iterative one. Instead, depending on the questions and needs of the farmer groups, the phases were succeeded organically. For example, in the case of dairy farms, we started with P2 as the calculation of individual production costs was the primary concern at that time. Furthermore, the phases interact highly when additional knowledge is gained. In P3, cognitive maps reveal both insights in the key features of a system and the links and tradeoffs between them. This interacts highly with P1 where key features were determined through observations and interviews.

Table 1. Implementation of the framework within three agricultural sectors: suckler cow farms, dairy farms and arable farms.

	Beef cattle	**dairy cattle**	**Arable crops and vegetables**
initiators	farmers	advisors	advisors
initial question	data sharing with respect to agrotechnical performances on the farms	calculation of cost for milk production	Insights in trade-offs and interactions within the production system
short evaluation	good and efficient process, farmers put forward questions, deliver data easily, good discussions, good atmosphere within the network	slow process, farmer involvement is difficult, advisors are needed as moderator/mediator	Farmers involvement not from the start, advisors not easily convinced of the general approach, good atmosphere within the network
Time frame 1	P1: identifying key features (discussions)	P1: identify key element (production cost)	P1: identify key features (observations)
Time frame 2	P2, P3: farm scan development, data collection, network meeting on key features and their interactions	P2: data collection on production cost	P2: farm scan development and data collection
Time frame 3	P2, P3: second round of data collection and network meeting on key features and their interactions	…	P3, P1: cognitive mapping (farmers, advisors)
Time frame 4	P3: cognitive mapping (advisors&farmers)	P1,3: discussion on production cost	P3: discussion on key features and their interactions

Second, although the approach was set up separately for the three cases, outcomes converge to common key features of major importance. These vary from technical and biophysical characteristics such as optimizing crop rotation to characteristics related to sales and logistics. As such, insights in common attention points may incite cooperation and learning between these farming sectors and novel strategy search within the organic farm system. Furthermore, the transdisciplinary stakeholder group also suggest, based on the cognitive maps and the quantitative farm models to further model and simulate system changes when a new farm strategy is considered on the organic farm. This phase is not included in the framework yet, as we have no empirical evidence or experience for this potential phase so far.

Conclusions

Through a transdisciplinary and system based approach, we were able to develop a framework to structure knowledge gathering and sharing on organic farming systems. Although the implementation differed a lot among the sectors, the common framework provides a tool for advisors and researchers to guide the knowledge structuring, depending on the farmers' needs, within different sectors towards the same system approach. This approach can be used to structure and improve knowledge transfer during network meetings and finally to support farmers decision making when adapting their strategies to fast changing socio-ecological demands. This approach might stimulate learning on common key features between sectors and even lead towards cooperation in the long term.

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