

Involved PhD research – a case study between agronomy and social sciences

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Abstract: In research projects based on questions which emerge from practice and from interactions with different stakeholders, researchers engage with research partners in a cooperative and interdisciplinary approach. In PhD projects, including a diverse network of partners and interdisciplinarity may be challenged by the short duration of the projects and by the positivist and reductionist approaches in which students are initially trained. Based on a concrete PhD research project on small-scale organic seed production, the objective of this work is to elucidate how interdisciplinarity and an action-base can nevertheless gradually be integrated by PhD students into an approach best termed as *involved research*. Reflection on the roles of partners, their involvement, motivation and points of view and on the evolution of questions posed during interactions between students and stakeholders contributes to recognizing the role of each partner, situating research postures, and identifying the types of knowledge and transformations produced. While PhD students and their research projects can evolve towards more holistic and constructivist approaches, it is crucial to maintain opportunities for reflection during their research in order to realize the potentials of involving all those involved in the projects and produce effective social learning processes.

Keywords: farmers' seeds, interdisciplinarity, multi-actor approach

Introduction

Action-based, phenomenon-oriented research and learning which is “socially connected to methods, professional practices and organizational structures” (Francis *et al.*, 2012) implies the participation of research partners from academic and non-academic fields. The possibility of introducing interdisciplinarity and an action-base into PhD research can be questioned. The simple fact that a PhD project is conducted over a short period of time greatly challenges the development of a working relationship based on a common understanding between actors and the consideration of long-term perspectives. In addition, conducting a problem-based PhD research project in partnership with human actors leads to a set of specific challenges and questions, namely concerning the social and professional competence required to efficiently deal with the needs and requests of the different partners and the multitude of disciplines involved. Finally, the evaluation of research results which cannot be planned for in advance and which includes academic and non-academic results has not yet been solved. This represents an additional risk for PhD students who will depend on the evaluation and recognition of their research for their PhD certification and therefore for their career perspectives.

However, some situations and research projects require interdisciplinary approaches and the inclusion of multiple stakeholders in ways that may not have been planned or fully accounted for by the researchers beforehand. In those cases, it is important to situate the research activities and

define the roles of involved stakeholders in order to avoid a naïve approach and amateurism (Hubert 2002). In the following, we will show how a concrete PhD research conducted by a graduate agronomist on small-scale, organic seed production gradually evolves to adopt more interdisciplinary approaches and involve stakeholders in different processes.

Emergence of a research project from a hot debate

The research project was sparked by a reflection on plant health by small-scale organic seed producers and researchers of the national agricultural research institute, INRA, in France. The producers involved in this discussion are members of the association of artisan seed producers “Croqueurs de Carottes” and of the “Réseau Semences Paysannes” (RSP). The RSP is a farmers’ network formed in 2003 to dynamically manage cultivated biodiversity and develop and share the relevant know-how. Based on a critique not only of modern breeding techniques, the seed industry and current seed laws, but of large-scale industrialized agriculture as a whole, the network develops alternatives to regain control over seed systems (Demeulenaere, 2013). The bean seed producers were faced with Common Bacterial Blight (CBB), a seed-borne quarantine pest on common bean (*Phaseolus vulgaris*) caused by the bacterium *Xanthomonas axonopodis* var. *phaseoli*. However, producers seemed less concerned about the actual plant health, but more about phytosanitary regulations not being coherent with the experiences and practices of small-scale artisan and organic seed producers. We emit the hypothesis that two different viewpoints are confronting each other, which go beyond the scope of CBB and refer more widely to the understanding of plant health. Whereas a more precise definition of these viewpoints will be part of the ongoing research, they can roughly be sketched based on considerations of Döring *et al.* (2011). The understanding of plant health represented by actual seed laws, including phytosanitary regulations, defends the ideal of pathogen-free seed to allow for healthy crops and the maximization of grain yields. While this strategy reduces damage to crops and delays the spread of pathogens, it is regarded by the involved farmers as an overly reductionist approach to plant health, disfavoring the resilience of cropping systems. Indeed, ecological plant protection relies on interactions in the ecosystem to provide regulation of pathogens and pests. Here, a more normativist approach based on a positive concept of plant health is stressed, “focusing on more complex interactions between plants and pathogens” in order to “move towards health”.

The debate on plant health can be qualified as a *hot situation*, as described by Callon (1999). Whereas the European legislation on plant health is considered a *frame* established on the base of one definition of plant health, the seed producers involved in the research project *spill over* and try to *overwhelm* this frame due to their understanding of plant health. Their understanding of seed production as co-production of farmer and nature (van der Ploeg, 2009) and as dynamic process is not compatible with the prescriptions of the laws on plant health. Facing actual seed laws, the small-scale organic seed producers see their activity, their livelihoods and their practices and know-how threatened. Interacting with other stakeholders in a *hybrid forum*, they are unable to find common definitions of the problem, let alone identify its causalities or measure its effects. Yet such a common framing of the problem is necessary before new legislations can be negotiated which would cover the needs of all stakeholders involved in the discussions. The producers who *spill over* the actual frame of seed laws engage in forms of cooperation to make their voice heard. When reviewing the proposals for regulations on plant reproductive material and plant health presented by the European Commission in May 2013 and the reactions of stakeholders, one cannot but conclude that common ground is far from being reached. For instance, the actors have diverging viewpoints on how to define an optimum crop production and therefore on the aims of seed laws. The actual seed laws reflect the aim of eliminating plant diseases such as CBB to maximize grain yields, whereas the small-scale organic seed producers involved in our research aim at obtaining stable yields over time with bean plants which are adapted to their production systems. Very importantly, the latter combine the aim of yield stability with the aim of

maintaining artisan seed production and associated knowledge and practices within local seed systems. Conflicting views may also be explained by differing perceptions of the definability and measurability of plants health as an objective entity.

In this context of hot debate, researchers at INRA were approached by producers with the request to show that the phytosanitary regulation defining quarantine measures for Xap-contaminated seed is not coherent with their production practices and experience. A PhD student was recruited who approached the subject with the tools available to her as graduate agronomist.

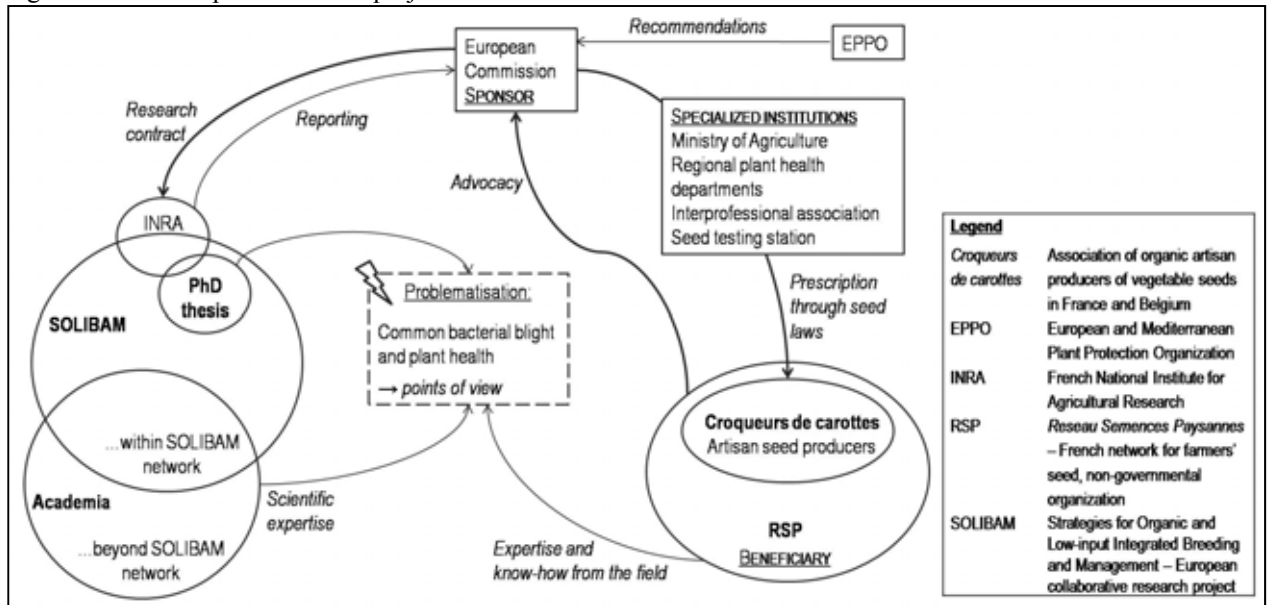
Situating the research and its partners

The research approach described here is best termed as *involved research* (“recherche impliquée”), according to the term proposed by Mougnot (2011). Although the English term does not reflect the multiple meanings and versatility of the French adjective *impliqué*, the different significations of *involvement* are appropriate to describe it. On one hand, the researcher gets fully involved with a project, an action, a social movement and accepts risks and uncertainties related to an evolving context. On the other hand, through its contextualization in a hot debate, the research has the potential to involve a multitude of actors who may relate to each other as allies or opponents. Involving these actors also means involving their modes of action. Beyond scientific results, such research has the potential of producing tensions, debates on acquired knowledge and social learning processes. The *potential* of involved research to engage with actors and produce social learning processes is stressed here because appropriate research postures need to be adopted and research interventions put in place to fully realize this potential. This should be taken into account from the beginning of a project wherever possible. In our case, however, the interaction of the PhD student with diverse actors has first led to the transformation of her point of view and on the research activities planned, implying a continuous problematisation process. This may in future lead to real common learning processes with diverse stakeholders.

Research partners and actors

In **figure 1**, the partners involved in the research project are depicted and the three partner categories attributed according to Hubert (2002). The artisan and organic producers of vegetable seeds, organized in the association *Croqueurs de carottes*, brought up the initial question and will hopefully profit from research results for their work. They are therefore defined as *beneficiary* of the research. The term *beneficiary* should not be understood as describing a passive role. The producers actively contribute to the problematisation of the CBB issue with the researchers. Although on researchers' side the PhD student and her supervisors are in charge of the project, a large number of other academic researchers are involved. The PhD project forms part of the large scale European collaborative research project SOLIBAM. Financial means, a network of partners and expertise in terms of scientific and farmers' knowledge are available within the SOLIBAM network. Scientific experts and practitioners beyond this network are approached for advice as needed. For instance, advice from vegetable producers, a plant pathologist, an agronomist with expertise in symbiotic relationships of legume crops, a statistician, a molecular biologist and sociologists is needed in order to apply theories and methods in an integrated approach.

Figure 1. Research partners of the project.



The European Commission (EC) has two major roles in the network of actors. On one hand, the EC is in charge of formulating seed laws, including phytosanitary regulations, influencing the practices of small-scale seed producers in a prescriptive manner. In this function, the EC is advised by other stakeholders, such as the European and Mediterranean Plant Protection Organization (EPPO), which elaborates recommendations on quarantine pests. In France, the European seed legislation and phytosanitary regulations are enforced by several institutions. The Ministry of Agriculture applies them in cooperation with a national inter-professional association for seeds and planting material (GNIS). The national working group for variety and seed testing (GEVES) of which they form part is responsible for testing seeds made available on the market for phytosanitary quality, among other criteria. The GEVES and its technical facility (SNES) can be considered as *specialized institutions* operating in the field of practical seed production. Although they are not actively involved in the research project, their actions influence the problematisation of the CBB issue. In general, such *specialized institutions* may also have an interest in research results or even disseminate them in the framework of future activities. On the other hand, the EC is the *sponsor* of SOLIBAM and this research project. Through a call for research proposals on agrobiodiversity and a selection process, SOLIBAM was established with the overall objective of developing “specific and novel breeding approaches integrated with management practices to improve the performance, quality, sustainability and stability of crops adapted to organic and low-input systems” (www.solibam.eu), based on the concept of diversity. Research projects such as SOLIBAM are in part commissioned by the EC to improve the knowledge base on which to build legislation.

Given that a PhD research project pursues the double objective of conducting academic research and of training a young scientist, an additional set of partners needs to be mobilized. They are not actively involved in research activities, but imply an additional set of reporting measures and constraints. For instance, the Luxembourgish research fund finances a PhD grant for the student and signs a contract with the student and INRA as host institution. The University of Liège is involved in directing the PhD thesis. For clarity, these institutions are not explicitly included in figure 1, but are part of the bubble representing the PhD thesis.

Research questions

The research question and its evolution are an indicator of the research postures adopted as the PhD project advances. The formulation and reformulation of the research question can be interpreted the result of *framing* processes within the research project: As contacts are established, partners involve, interactions are created and situations experienced, new points of view need to be included in the question treated. The initial question posed by artisan seed producers€ reflects the hot debate from which it emerged:

*How can we show that the phytosanitary regulation classifying *Xanthomonas axonopodis* pv. *phaseoli* as quarantine pest on bean seed is not coherent with production practices and experiences?*

A first step in the PhD research process was the reframing of this question according to the hypotheses of the student. These were strongly influenced by her background as graduate agronomist specialized in plant breeding, as she asked

Do common bean landraces have higher genetic variability among populations than commercial varieties? Does higher variability confer higher adaptability to new environments and pathogens?

Which other adaptation processes occur when locally adapted common bean accessions are cultivated in a new environment?

Do seed laws correspond to the situation of small-scale organic producers?

The first question focuses on the genetic variability of the varieties produced by the small-scale seed producers as source of adaptability. Other adaptation processes more reliant on the interactions between plants and their environment, such as epigenetic effects and the interactions between plants and soil microorganisms are explored through the second question. Thus the ecosystem in which seed production takes place is accounted for. The student expected that the incompatibility between seed laws and farmer practices, reflected in the third question, could be fully explained by differences in the genetic variability and adaptability of the bean plants artisan seed producers grow, as opposed to the commercial varieties produced by large-scale seed enterprises. The producers and their practices are considered as part of the production environment and as an important factor in selection and adaptation processes. Beyond their practices in crop management, their situation and needs are accounted for as a stable and objective entity affected only by the biological interactions happening in their fields. In summary, this approach reflects the aim of comparing seed regulations with *the* situation on farmers' fields in order to produce a *verdict* on the pertinence of actual seed laws. The term verdict is borrowed from the legal vocabulary here to express a vision of the researcher acting as neutral observer able to produce an objective and universal judgment on a situation. Field trials in farmers' fields with the concerned farmers' varieties are designed and sown in order to define that situation. Interactions between the farmers, researchers, decision-makers and other institutions are kept at a distance. The fact that the hot debate on plant health may constitute the confrontation of contrasting understandings of plant health is implicitly accounted for, as CBB as particular case is no longer mentioned in the questions. However, the contrasting viewpoints are not made explicit and are regarded more as personal opinions threatening the neutrality and objectivity of research than as an interaction to explore.

In her discussions and interactions with diverse stakeholders, the PhD student quickly realized she would not be able to treat a question concerning plant health in the context of small-scale organic seed production without making their understanding of plant health explicit. The contrasting viewpoints were integrated into the research in a third reframing of the research question. This is when a sociologist was taken on board the project as co-supervisor. The current question is formulated as follows.

Which are the elements of plant health management facing Common bean blight in the context of small-scale organic bean seed production?

The overall aim of the research now is to develop an approach to plant health in partnership with the concerned farmers and to reflect on CBB and its management *from this point of view*. This aim entails a more inter-disciplinary approach, reflected by a number of sub-questions. The agronomical approach and field trials are maintained, as the biological interactions in farmers' fields remain relevant for the exploration of farmers' understanding and management of plant health. Initially, the trials situated in farmers' fields were also thought to constitute platforms to facilitate interactions between the researcher and the farmer and drive common learning processes on the management of plant health in small-scale seed production (Why this has not been realized is discussed in the next section). Comprehensive interviews with stakeholders were included as new element in the research project to analyse *how producers, researchers and other actors respond to the disruption brought by the Common bacterial blight concerning the legal framework. Seed quality* and its definitions are also explored in the framework of these interviews. With this reframing of the question and the adoption of other methodological tools, contrasting understandings of plant health can be made explicit. Furthermore, the situation, practices and needs of actors are no longer understood as stable, objective entities needing to be defined, but as a dynamic base for a learning process. The researchers themselves are recognized as forming part of a network of involved actors, instead of being neutral observers.

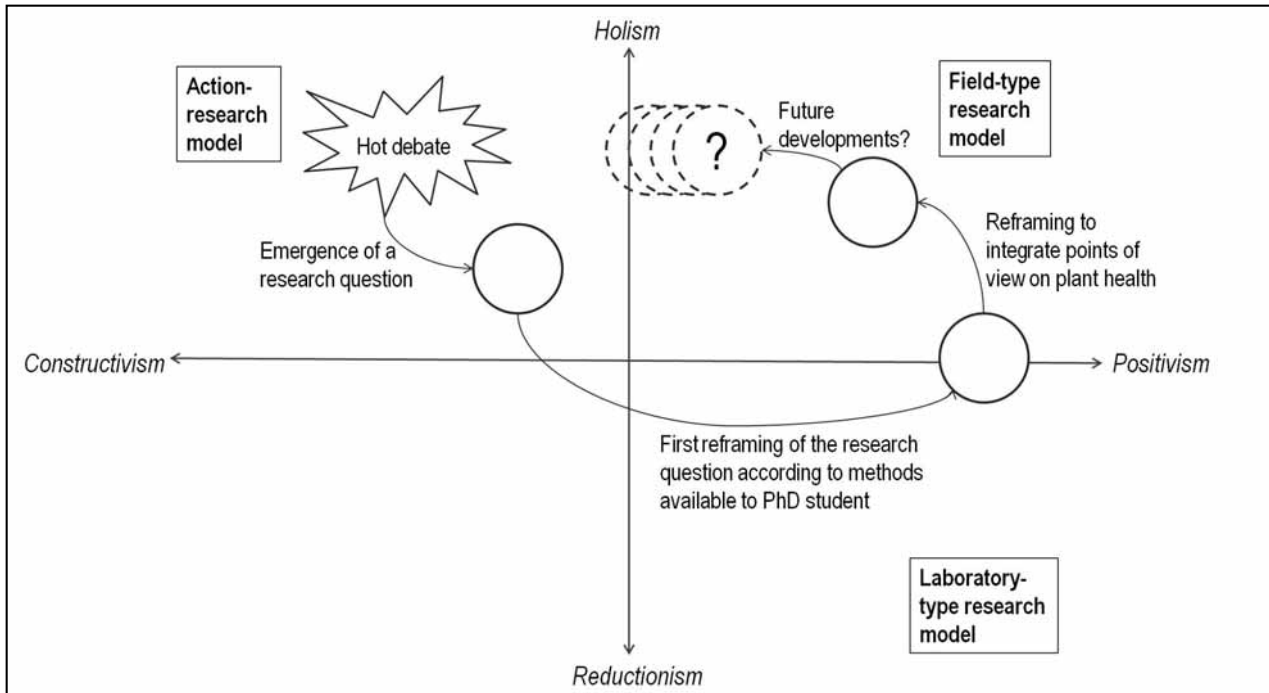
This third research question and the associated methodology do not represent the end of a dynamic evolution or the last frame to our reflections on plant health, so we hope. Indeed, first considerations are already being made on how to facilitate the co-production of knowledge.

Navigating between points of view

Beyond cognitive forms and methodological tools, the reframing of research questions reflects changes in the posture adopted by the researcher and the integration of new points of view. From the initial posture of supposedly neutral observer of biological interactions and stable needs, the understanding of the PhD student's own work has evolved to include reflection on her own activity in a network of project partners. Building upon considerations of Hubert (2002) on research postures according to the points of view on natural resources proposed by Richard Bawden (1997), the evolution of the research postures adopted by the student is represented in **figure 2**.

As discussed earlier, the initial question which sparked the research project emerged from debates on seed laws and phytosanitary regulations, marked by contrasting points of view on plant health. This initial question is transformed by the PhD student, driven by her training as agronomist. The approach then adopted can be described as positivist. Methods employed represent a mix between *laboratory-type* and *field-type* research (Hubert 2002): The first set of research questions referring to genetic variability is based on hypotheses which are verifiable through analyses and thus qualifies as laboratory-type research, whereas the field trials aim at understanding interactions within complex productions systems. The first approach adopted by the researcher is thus situated at the interface between techno- and eco-centered researches in figure 2. The three research models and points of view constitute clear-cut categories in the conceptual model, but in practice rather constitute a continuum between the extremes on the axes reductionism-holism and positivism-constructivism (Bawden, 1997).

Figure 2. Evolving research questions according to Bawden (1997) and Hubert (2002).



With the second reframing of the research question, the approach is pushed further into the upper right quadrant representing eco-centred, field-type research. The explicit integration of diverging understanding of plant health and the qualitative study thereof constitute a step towards holo-centred approaches and the *action-research model*. Although the researcher acknowledges the fact that she cannot act as a neutral observer, but is an engaged actor in a network of stakeholders, her research is described as *rather positivist*. She recognizes that even the results of molecular analyses indicating the genetic variability of bean plants will be interpreted according to a context and point of view. However, a systematization of interactions in collective action and common learning processes has not (yet?) occurred, as research methodologies remain centralized around the researcher. Again, it is important to keep in mind that the clear-cut conceptual research models translate into continua between positivism and constructivism along which research postures evolve in practice.

The evolution of the research question is ongoing and reframing processes are sparked by interactions between diverse actors. Although they have not been formally and systematically facilitated, such interactions have pushed for constant improvements of the research project. The systematic facilitation of such interactions may produce social learning processes between research partners. For this to happen, appropriate research interventions must be planned with research partners according to their practices and interests. Considerations put forward by Döring *et al.* (2011) on the definition of plant health may be of great value for the future development of the project. Rather than defining plant health as an objective entity, they propose a procedural concept consisting of a set of rules for debate in order to incorporate different viewpoints on the continua between naturalist and normativist approaches, negative and positive definitions, reductionism and holism and functionality and resilience.

Conclusions

This particular example may serve as case study to show the evolution of relationships and points of view in a research project involving academic research institutions and extra-academic research partners. An initial research question emerged from a hot debate involving diverse stakeholders is transformed as it is first adopted by academic researchers and then confronted with contrasting viewpoints in a network of research partners. After being modified by the PhD student to conform with a rather reductionist approach, new elements and points of view are integrated. The research evolves as involved research and questions move towards a holist view. A PhD student trained in rather positivist research approaches evolves towards a more constructivist understanding of her research. The question posed at the beginning of this contribution, i.e. whether it is possible to introduce interdisciplinarity and an action-base into PhD research, cannot be answered with a clear yes or no. In practice, research approaches do not constitute clear-cut categories, but research projects can move along the continua of more or less interdisciplinarity or more or less action-based interaction with research partners. What we can conclude here is that PhD research constitutes an opportunity to evolve towards interdisciplinary and action-based research with the aim of facilitating the co-production of knowledge in a network of research partners. In order to recognize the role of each partner, situate one's own research posture and identify the types of knowledge and transformations produced, it is crucial to maintain opportunities for reflection on the own activities in research projects.

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