

# Co-designing innovative cropping systems through long-term on-farm experiments

## Problem

In order to reduce their dependence on inputs, farmers would like to build more resilient cropping systems based on innovative agro-ecological practices. This would enable a reduction in pesticide use and soil tillage. They face several barriers:

1. The lack of knowledge adapted to the local context. This is often made worse by unvalidated theories and discussions found on social media networks;
2. The technical and agronomical complexity of challenges, as well as social and financial risks linked to the implementation of systemic innovations at farm level;
3. The difficulty of assessing the long-term impacts of the new system of practices on soil, crops and sustainability;
4. The time and perseverance necessary to achieve a new profitable systemic equilibrium despite the setbacks and failures encountered.

## Solution

Setting up a participative research group including scientists (social and agronomical), advisors (experts) and a cluster of farmers sharing the same vision (or targets). In our case: "how to reduce pesticide use and tillage intensity". Through a collaborative agreement, every actor of the group is engaged for a minimum of 3 years to progress towards the "common vision": "an agriculture without pesticides or soil tillage". Each farmer provides the group with a long-term 1 ha agro-ecological experimental field (EP<sup>1</sup>) chosen from within a larger field (CP).

The two fields support the same crop each year, with the difference between the fields being that the practices implemented in the EP aim to reach the common vision. A sub-group composed of the farmer, agronomist and advisor take technical decisions via consensus. In return, the financial risk is distributed 50/50 between the farmer and the research institution. The scientific institution monitors the crop (seedling emergence, pest and disease occurrence, biomass production, yield) and soil (chemical, structural and biological fertility) parameters on both EP and CP fields. Different forms of group meetings are regularly organised to share and discuss the results gathered on each farm, share actors' know-how, co-design solutions and to explore original external experiences.

## Benefits

This participatory research design that mixes scientific knowledge with actors' points of view allows for these groups to deal with a complex systemic transition where there is often a shared long-term vision but the concrete form it will take remains largely unknown. It avoids the reproduction of errors, reduces the social,

## Applicability box

### Theme:

Cropping system, Learning, Rotation, Multiple cropping, Inter cropping, Assessment, Field

### Agronomic conditions

Sociotechnical participatory approach, of value whatever the conditions

### Application time

All year long

### Required time

Undefined, minimum of 3 years

### Period of impact

All year long

### Equipment

Social, agronomical and technical know-how, financial support, specific machinery and seeds

### Best in

Multiactor complex systemic innovation. Groups of farmers, scientist and advisors cooperating with each other to evolve towards agroecology



Picture 1: Individual meeting between a farmer and 2 advisors to discuss the management strategies to be tested (Eleonore Bidaine)

1. EP= experimental plot; CP= control plot

technical and financial risks inherent to change and combines the acquisition of social, technical and scientific knowledge into a coherent corpus while fostering the adoption and propagation of innovation.

### Practical recommendation

- Lots of time and attention are required to build the group. Start with a limited number of farms (minimum 3). Although a diversity in point of view and context between the actors is needed, a community with a shared problem is also imperative. The involvement of a sociologist experienced in intervention research methodology is essential because actors' interactions are at the core of the approach. All participants have to share a common issue and have to be convinced that they cannot progress without each other.
- During the process the challenge is to keep the farmers involved in the group and in the experiment. Therefore, it is important to support intensive and diversified interactions between the actors involved such as: study trips, conferences, large group meetings, local sub-group fields visits and on farm meetings at critical moments of the crop cycle.
- Once a year, individual on-farm meetings are needed to share agronomic and scientific results, build a shared comprehension of what has happened and evaluate possible improvements or alternative solutions (Picture 1). Afterwards these observations are shared and debated with the group.
- Reactivity and flexibility are needed from all of the actors in order to enable them to face unpredictable events. The time and money invested by farmers have to be minimised by the group covering costs and taking on additional tasks such as: transporting machinery, searching for suitable seeds, sampling and analysis, organisation and management of meetings and visits.
- From a statistical point of view, as each farm implements a specific action plan it is necessary to adopt a Before After Control Impact design methodology where performances of the impacted site (EP) can be compared to the performances of the control site (CP) (Gyselynck et al., 2022).
- As this is a long-term multidisciplinary relationship with the reciprocal commitment of actors, it is necessary that the institutions supporting the research scheme ensure the minimum funding needed to maintain, in the long term, the initiated dynamic of transition.

### Further information (approx 150 characters)

#### Video

- Presentation of the group experienced in the DiverIMPACTS context. French with English subtitles. (<https://www.diverimpacts.net/service/videos/organic-conservation-agriculture-in-the-diverimapcts-project.html>)

#### Further readings

- Gyselynck W., Jamar D., Pitchugina E., Planchon V., Denargel M., Dierickx S., San Martin G., Stilmant D. 2022. HOW TO FACE THE CHALLENGE OF ANALYSING THE RESULTS OF ON FARM EXPERIMENT TO SUPPORT PARTICIPATORY RESEARCH SCHEMES? 16pp. Contribution to be published and presented in the 14th IFSA Conference (<http://www.ifsa2022.uevora.pt/>)

### About this practice abstract and DiverIMPACTS

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DiverIMPACTS: The project is running from June 2017 to May 2022. The overall goal of DiverIMPACTS - Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability - is to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

**Project website:** [www.diverimpacts.net](http://www.diverimpacts.net)

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