Multi-stakeholder design to change water quality at catchment level

Raymond REAU, INRA, France

Quality of drinking water from catchment areas
Inventory of the french situation

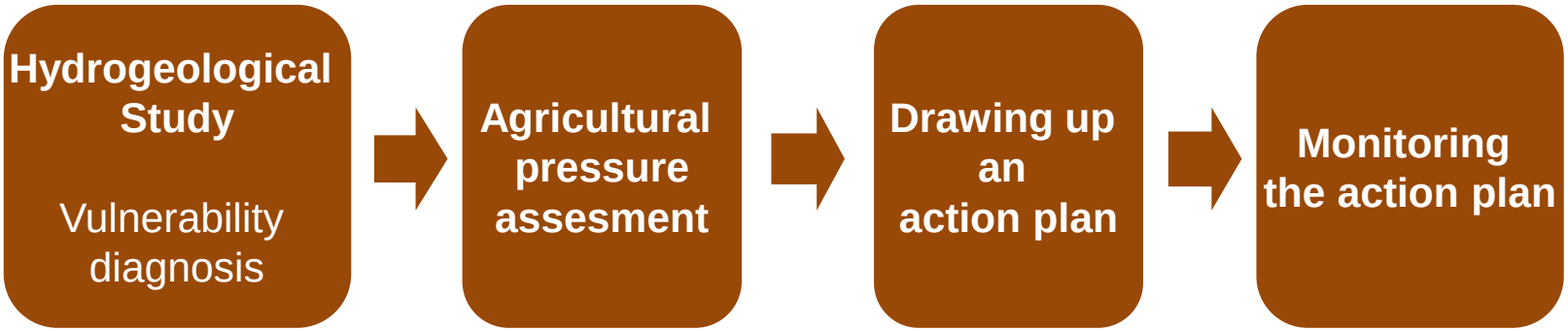
- Between 1998 and 2008,

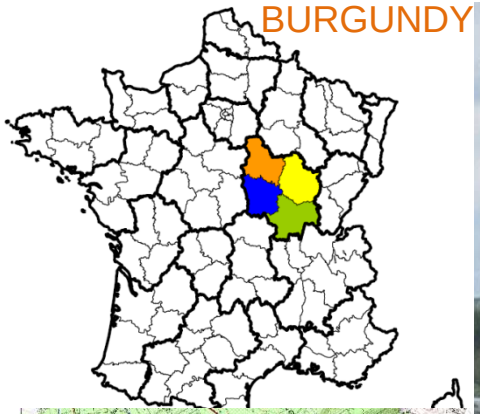
1,958 catchments were abandonned because of quality problems,

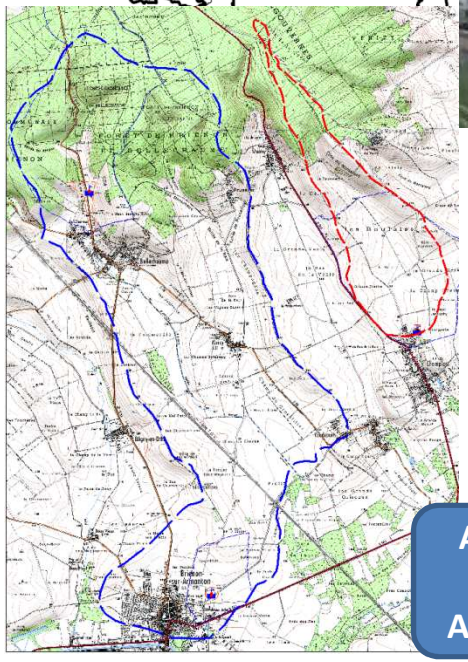
878 of them due to pollution from agricultural sources (SE Santé, 2012).

- Tomorrow, water quality must be improved in **2,500 catchments** (Water Framework Directive)

→ A failure of advice based on diffusion of single agricultural good practices. Need to change agricultural systems, to think out of the box, and need to change the mechanics of projects





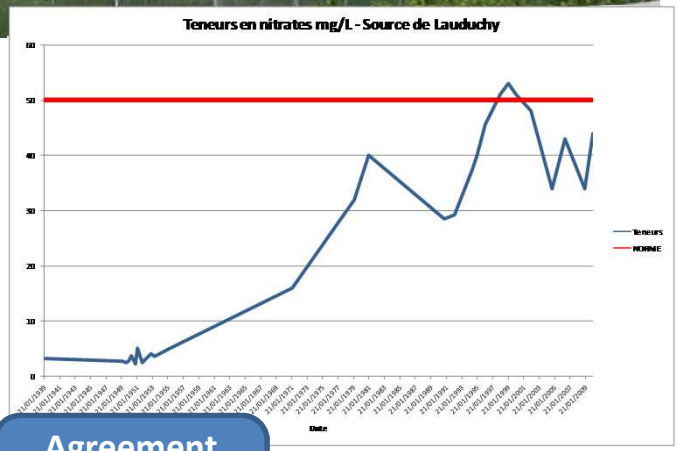


Groundwater catchment area of Brienon (89)

A nitrate problem

Agricultural area : 1700 ha

Main crop.system **: OSR-W Wheat – W Barley**



Agricultural pressure ASSESSMENT

Choice of water quality target

Agreement on the Action plan

years 2010 2011 2012 2013

START

DESIGN WORKSHOP

First Potentially leachable soil Nitrogen

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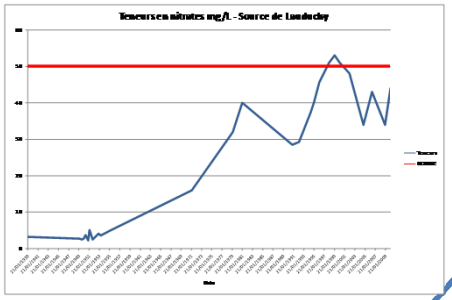


Groundwater catchment area of Brienon (89)

6. **Discuss the proposal** and adopt ing the action plan

7. **Annual monitoring of the action plan**

Steering Committee

Interviews of water drinkers and other local stakeholders

0. Analysis of **stakeholders' demands and expectations**

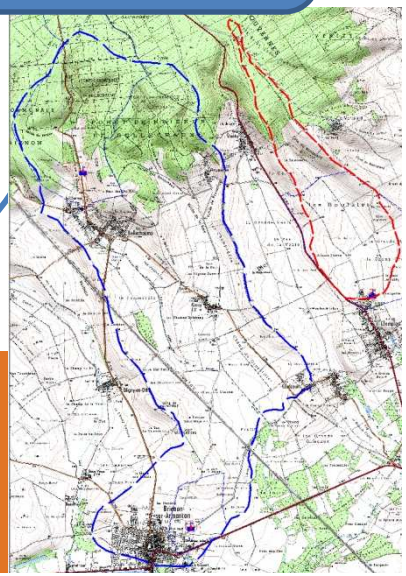
1. Choosing the **target**

5. **Draft an action plan** after a democratic vote between local farmers (23)

2. Collect and exchange knowledges: **assesment, inventory**

Local Farmers

(8, then 23)



4. Assess the **farmers'offer / stakeholders's demands**

3. Design **cropping systems**

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Choosing the target
Creating a vision

Drafting
an action plan

Annual monitoring
and evaluation

Creating and sharing a vision of water quality

"Change of mindset" by Steering Committee

- A future for mid and long term
- Criteria : nitrate concentration …
- Negotiations on threshholds : Nitrate 37 mg/l …

"Change of mindset" among farmers

- **Negotiations on agricultural thresholds**
  Nitrate losses < 30 kg N/an, Indigo Iphy > 8
  Involving **entire** agricultural area + **all** farmers
- **Gathering and exchanging knowledge**

Complex links between practices and water quality
Water-friendly practices of present cropping systems

Thinking out of the box : *de novo* design

(Meynard, Bos et Dedieu., 2012)

Who : 8 farmers + 3 agronomists

4 steps from nov. to dec. 2011

1. **Assessment** of the present cropping systems in the area
2. Propose innovative cropping systems **(farmers)**
3. Ex ante assessment of sustainability (**agronomists**)
4. Tuning and improvement of the innovative cropping systems

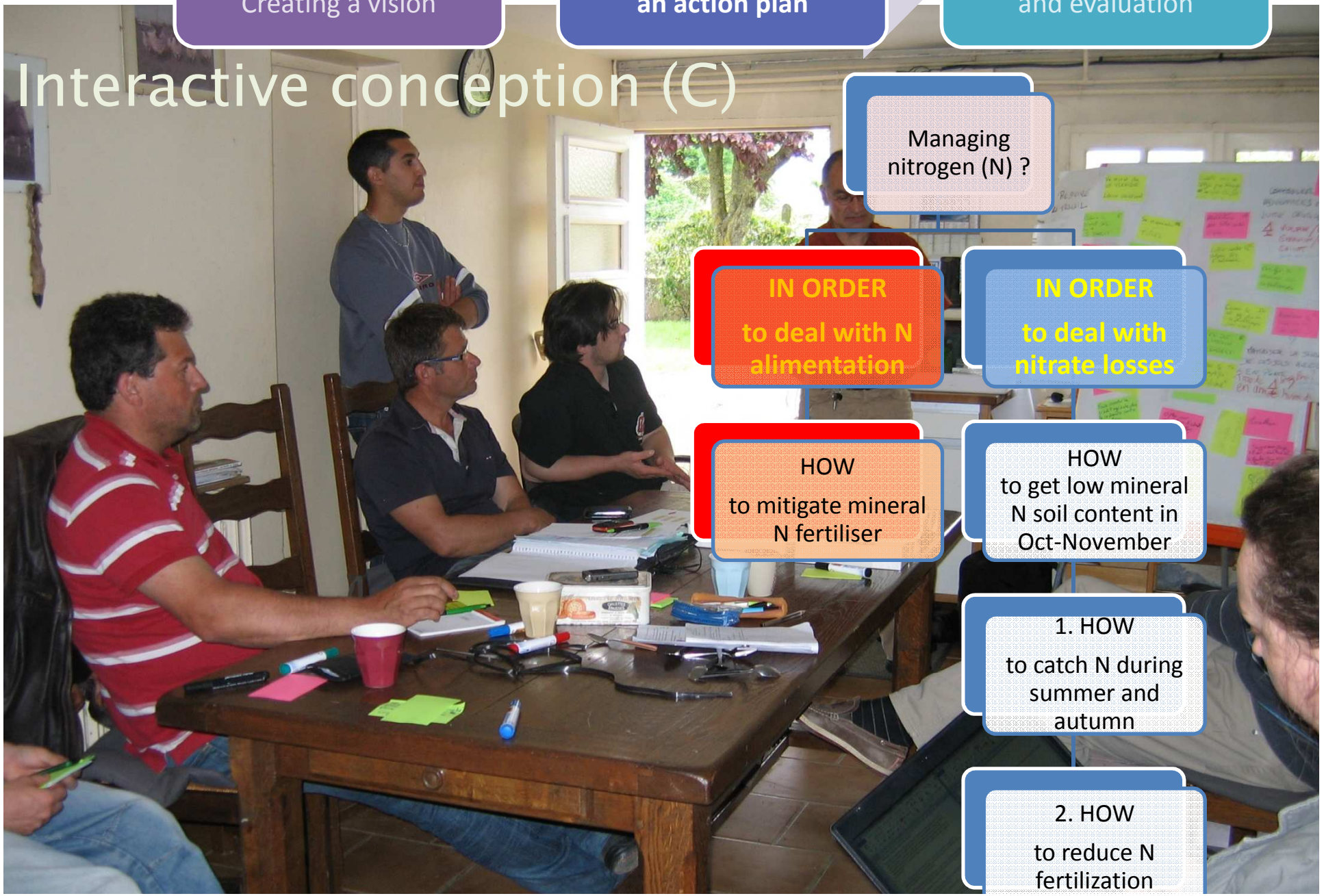
Output : new cropping systems

Choosing the target
Creating a vision

Drafting
an action plan

Annual monitoring
and evaluation

Interactive conception (C)



Managing nitrogen (N) ?

IN ORDER
to deal with N alimentation

IN ORDER
to deal with nitrate losses

HOW
to mitigate mineral N fertiliser

HOW
to get low mineral N soil content in Oct-November

1. HOW
to catch N during summer and autumn

2. HOW
to reduce N fertilization

Choosing the target
Creating a vision

Drafting
an action plan

Annual monitoring
and evaluation

Designing cropping systems with local farmers

Choosing a scenario able to reach the target

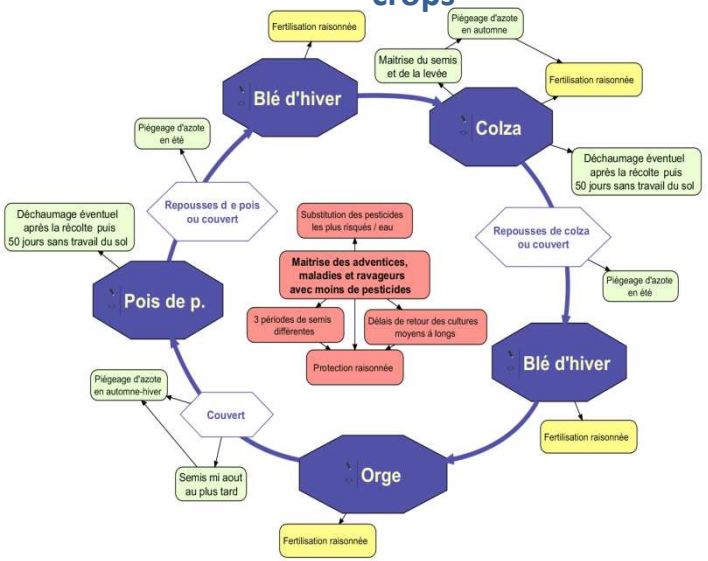
De novo design of 24 different cropping systems, before their assessment

- Need to forgo present cropping systems
- D*e novo design and assessment of ambitious cropping systems*
- Fine-tuning a generic cropping system to different farms

A timetable of changes in practices open to future changes

Output : spatio-temporal scenarios for the area

Diversifying the crop sequences, Performing successfull catch crops



Presentation of the project to 23 local farmers

Vote : 22 YES/23 , 1 NO/23

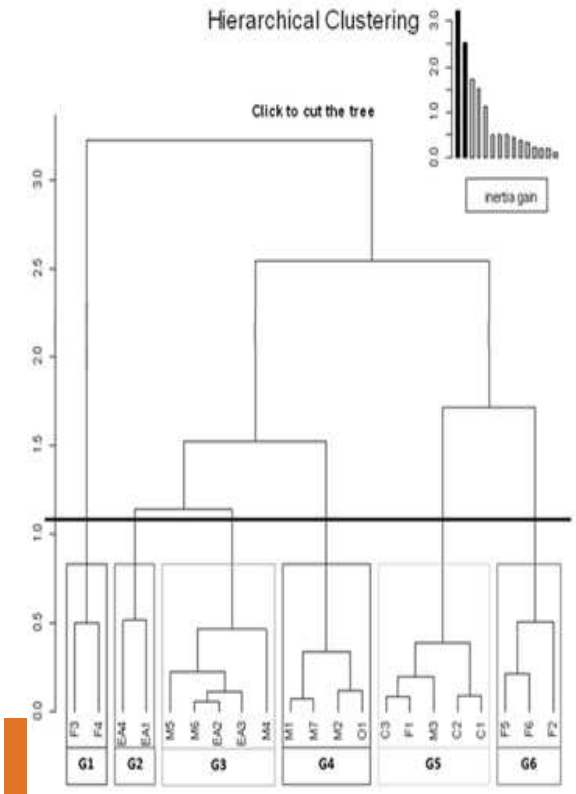
Choosing the target
Creating a vision

Drafting
an action plan

Annual monitoring
and evaluation

How farmers'offer satisfy stakeholders demands ?

An original method to share sustainability's visions enabling tensions among stakeholders to be eased



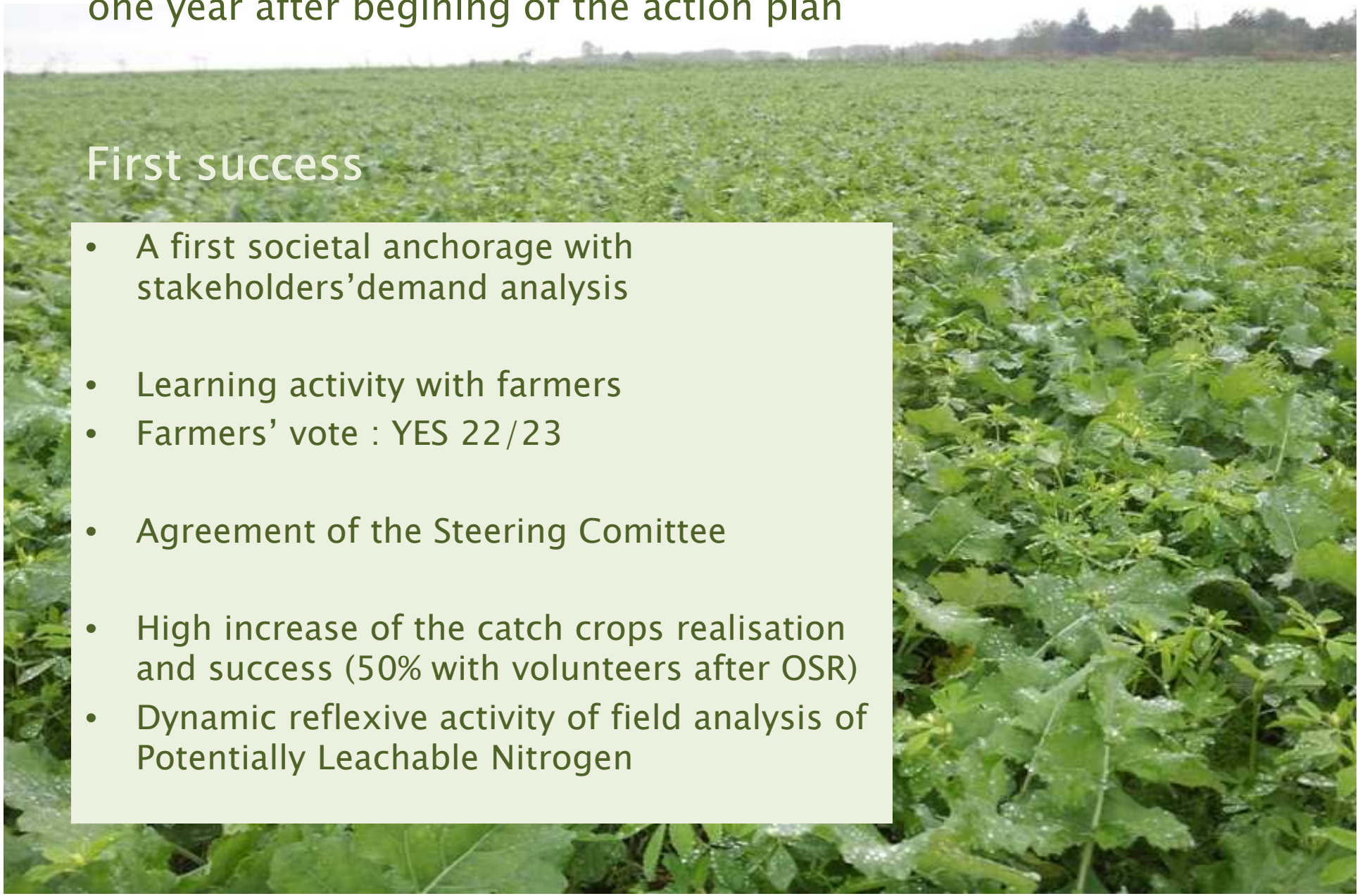
Ex ante assessment of 6 groups of stakeholders' satisfaction

(for ploughed deep soils) (Ravier et al., accepted)

GROUP Crop. systems	N° 5	N° 1	N° 6	N° 4	N° 3	N° 2
Actual 0	++	++	++	+	+	+
Actual 1	++	++	++	+	+	+
B1 S.Barley	++	++	++	+	+	+
B2 S.Barley	++	++	++	+	+	+
B1 S.Pea	++	++	++	++	++	++
B2 S.Pea	++	++	++	++	++	++
B1 Sunflower	++	++	++	++	++	++
B2 Sunflower	++	++	++	++	++	++

First socio-technical innovation's results

one year after begining of the action plan



First success

- A first societal anchorage with stakeholders'demand analysis
- Learning activity with farmers
- Farmers' vote : YES 22/23
- Agreement of the Steering Comittee
- High increase of the catch crops realisation and success (50% with volunteers after OSR)
- Dynamic reflexive activity of field analysis of Potentially Leachable Nitrogen

CONCLUSION

Strengths

- Interaction between people is usefull for acquisition of knowledge, knowhow and skill (Brunet, 1994) and for **learning**
- Knowledge (K) is useful to define step by step unknown objects (Concept C) (Hatchuel, Le Masson, Weill, 2012) inside the **design activity**
- Co-design of scenarios based on **local stakeholders** rather than their representatives, through a territorial dialogue
- An original method in order to realize **multicriteria and multiactor assessment** enabling tensions to be eased (Ravier at al., accepted)

Weaknesses

- How to work in a larger area ?
- What to do, when the sustainability performances of the farmers' proposals are not suficient : new co-design, system generation or system optimisation ?
- Lack of knowledges, uncertainty about pesticides impacts
- Need for new competences & skills among the territory managers

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Thank you
for your attention !

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Steps and roles during a design workshop

Reau et al., 2012