

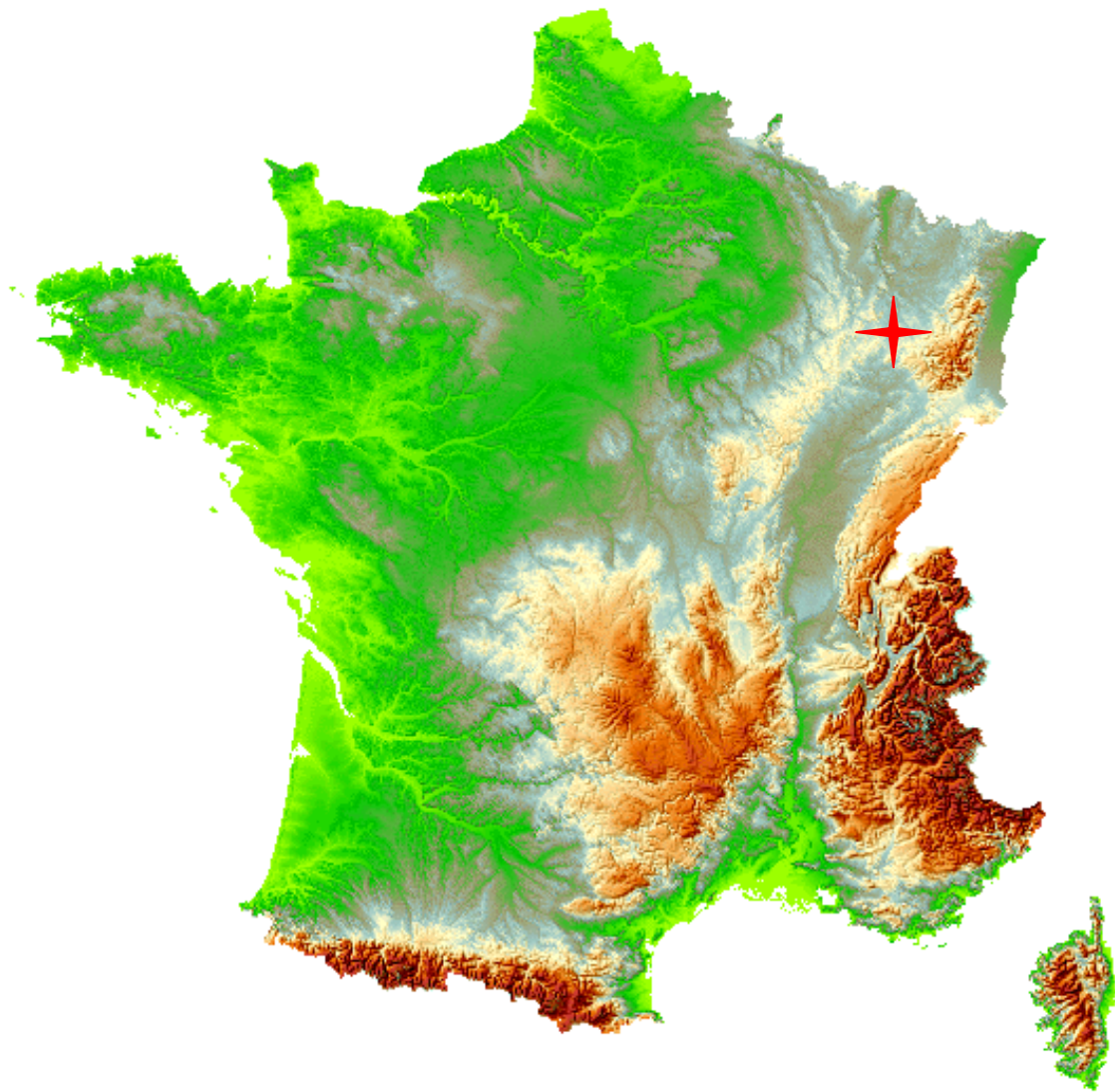
# Prototyping complementary organic farming systems in a small territory : a multi-attribute approach

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# Mirecourt INRA experimental station

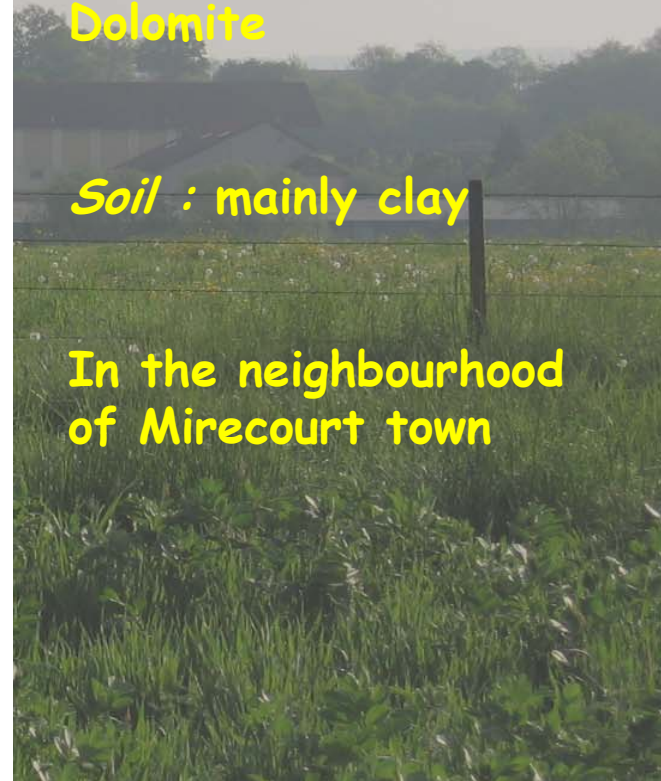


*Continental climate*

*Parent rock : Marl and Dolomite*

*Soil : mainly clay*

*In the neighbourhood of Mirecourt town*



# A focus on environment health in farming systems

- ✘ An increasing interest for farming systems environmental impact
  - ▣ Which kind of Agricultural system is environmental friendly ?
  - ▣ In a small territory, how can farming systems work together in order to respect the environment ?
- ✘ What kind of methods is available to answer those questions ?
  - ▣ prototyping of multi-objective farming systems
  - ▣ designing complementary farming systems respecting environment in these small territories

# In this presentation

✗ Prototyping a multi-objective farming system : a participative approach inspired from Vereijken (1994).

- ✗ Designing : declining system's objectives
- ✗ Evaluating : experimentation at the farming system level
- ✗ Modelling : multi-objective approach

✗ Application of this method at 2 organization levels

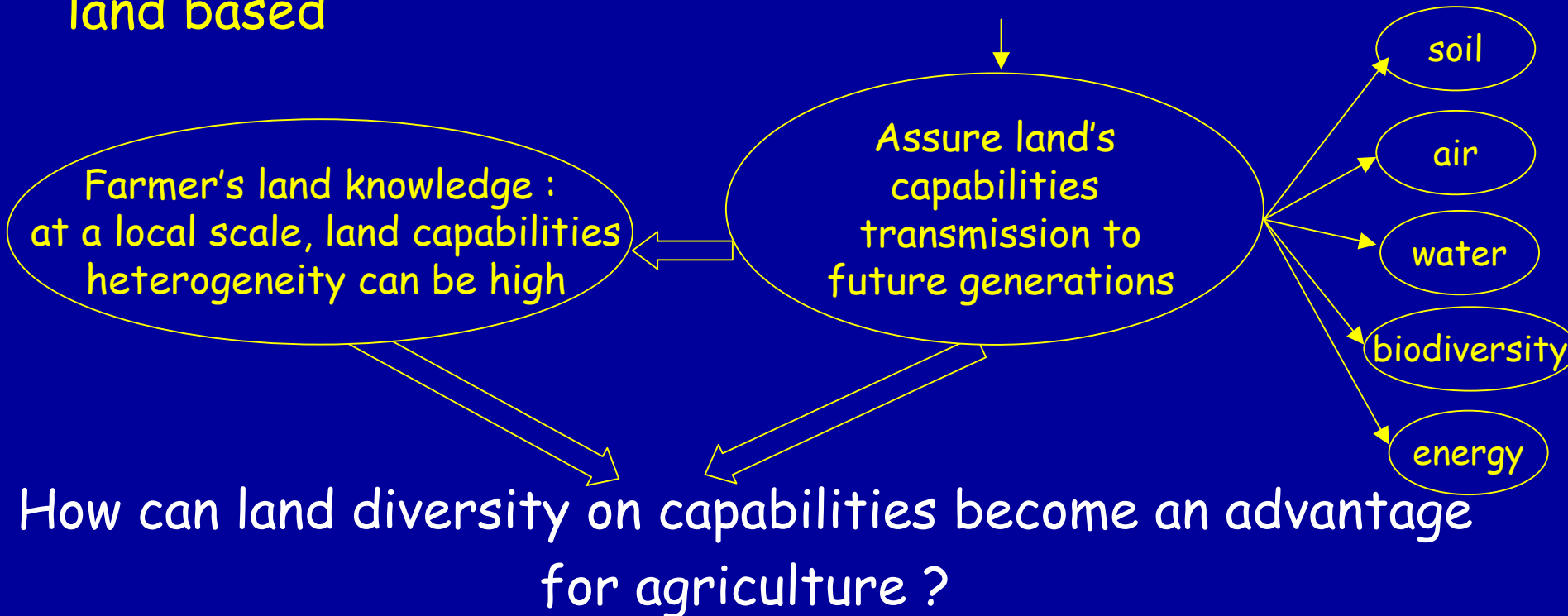
	Small Territory	Farming System
Designing	X	X
Evaluating		X
Modelling		X



# Designing complementary farming systems respecting the environment in a small territory

# Designing complementary farming systems respecting the environment in a small territory : hypothesis and principles (1)

Hypothesis: Environmental sustainability in agriculture is land based



# Designing farming systems on the allocation of local capabilities : Mirecourt experimental station land



# Designing complementary farming systems respecting the environment in a small territory : hypothesis and principles (2)

Valorisation of cultivated and grassland fields

- Livestock contributes to nutrients' cycles

Low external input

- Increased use of labour and *skill* offers a way out (Schiere *et al.*, 2002)
- Low external inputs is a way to slow down nutrients' cycles

**Complementary organic mixed crop livestock systems**

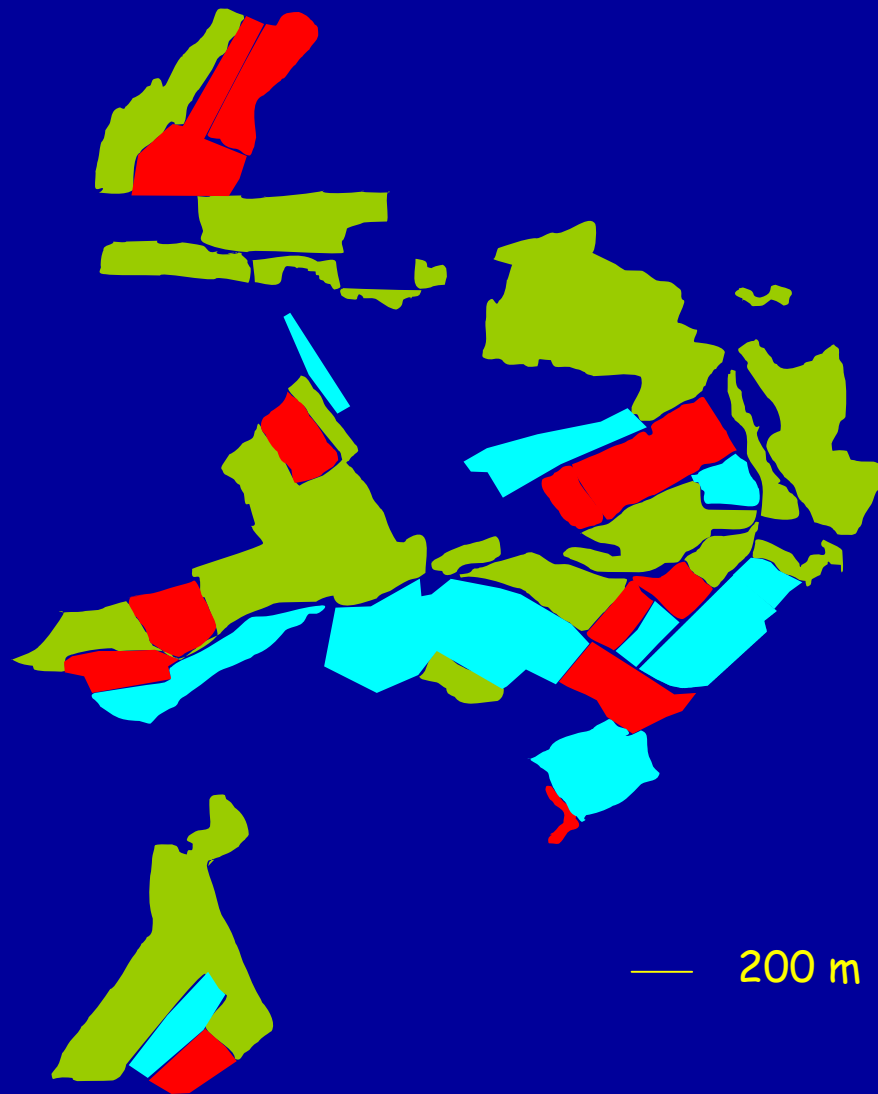
Valorisation of the small territory's land capabilities

- Complementary systems favouring mutual and equivalent local exchanges lead to a better environmental respect



# Designing mixed crop-livestock systems on the allocation of local capabilities : Mirecourt experimental station land

**Edaphic properties:**  
Can we grow legumes ?



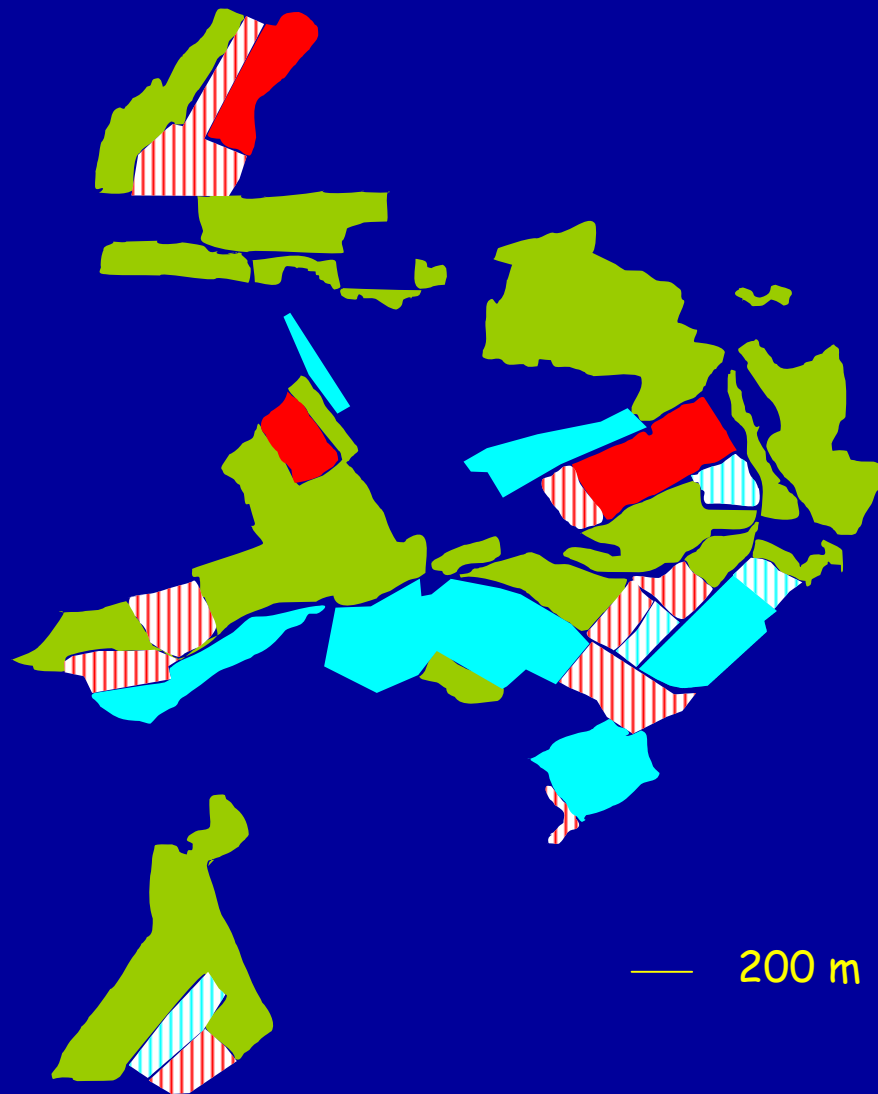
Yes  
→ 8 years crop rotation  
(3 years period of legumes)

No  
→ 6 years crop rotation  
(3 years period of rotation grassland)

— 200 m

# Designing mixed crop-livestock systems on the allocation of local capabilities : Mirecourt experimental station land

**Edaphic properties:**  
Can we grow spring crops ?



Yes

→ 8 years crop rotation with spring and winter crops

→ 6 years crop rotation with spring and winter crops

No

→ 8 years crop rotation with winter crops only

→ 6 years crop rotation with winter crops only

# Designing complementary farming systems respecting the environment in a small territory : hypothesis and principles (3)

## Valorisation of crops and grasslands

- Livestock contributes to nutrients' cycles

## Low external input

- Increased use of labour and *skill* offers a way out (Schiere *et al.*, 2002)
- Low external inputs is a way to slow down nutrients' cycles

## Complementary organic mixed crop dairy systems

## Valorisation of the small territory's land capabilities

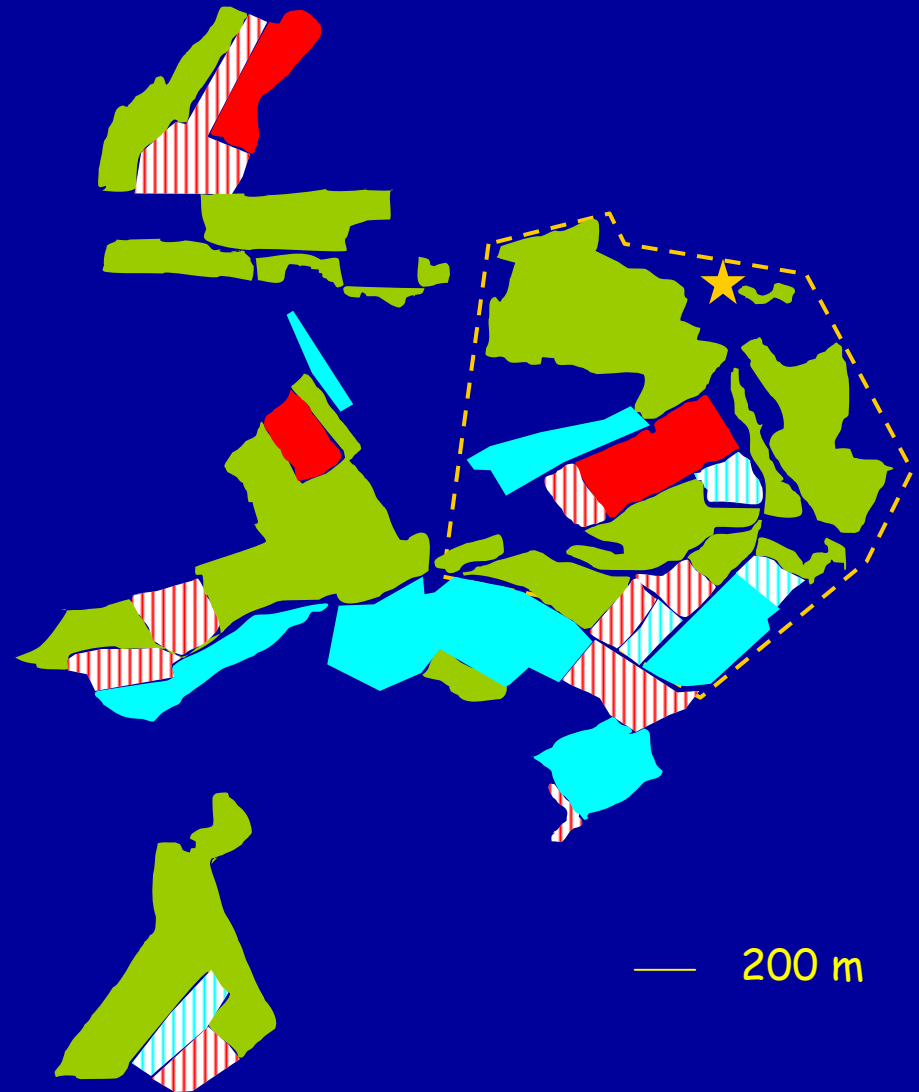
- Complementary systems favouring mutual and equivalent local exchanges lead to a better environmental respect

## Dairy past of the experimental station

- Organic dairy system is self sufficient in nitrogen

# Designing mixed crop-dairy systems on the allocation of local capabilities : Mirecourt experimental station land

Accessibility :  
Social acceptance,  
trafficability, road  
risks : Can dairy cows have a  
daily access to the fields ?



# The 2 complementary organic mixed crop-dairy systems

GFS

conserved forages

37 dairy cows +  
replacement heifers

pastures

79 ha permanent grasslands

Spring and summer milk  
Beef (culled cows)

MCDS

slurry, manure

Conserved forages, straw, concentrates

crops

60 dairy cows +  
replacement heifers

pasture

48 ha permanent grasslands +  
106 ha cultivated  
(4 crops rotations)

Autumn-winter milk  
Beef (culled cows)

slurry, manure

Prototyping each multi-objective  
farming systems embedding their  
complementarity  
at the territory scale :

Prototyping each multi-objective farming systems embedding their complementarity at the territory scale :

## Designing each multi-objective systems

- Defining and prioritizing the multiple objectives assigned to each system
  
- Defining rules used
  - to achieve the objectives
  - to stabilize agricultural practices from one year to another on the system
  
- Defining criterias to evaluate the systems according to their objectives

Prototyping each multi-objective farming systems embedding their complementarity at the territory scale :

## Evaluating each multi-objective theoretical systems

Experimentation at the system level : environmental considerations in organic mixed crop-dairy system

■ Organic : anticipation of agricultural practices has to be done at the production system level

■ Mixed crop-dairy : a system approach is a way to study the complementarity between crop and livestock production

■ environmental considerations in a mixed crop-dairy system :

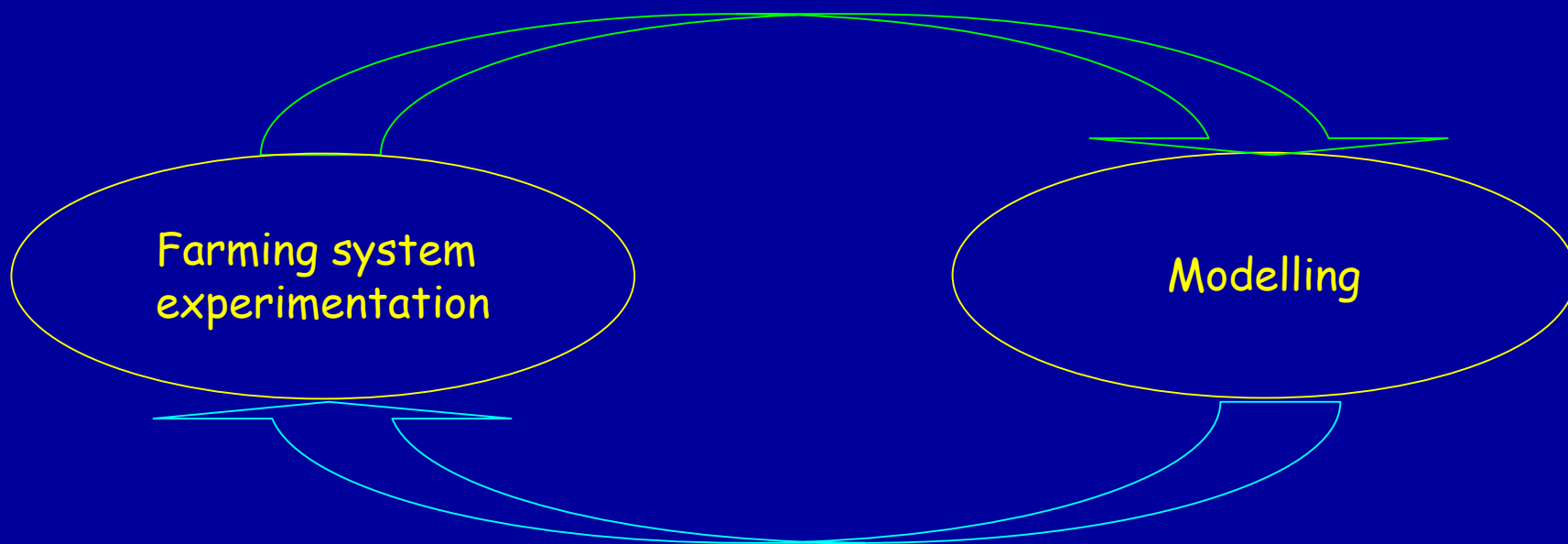
- time considerations
- space considerations



Prototyping each multi-objective farming systems embedding their complementarity at the territory scale :

## Iterative multi-objective modelling

- agrotechnical, agroecological knowledge
- stakeholder's agreement
- practical feasibility



Test risky theoretical prototypes proposed by the model including farmer's scenarios

# Conclusion

■ In INRA Mirecourt station *2 dairy* systems are being *prototyped and tested* in order to :

- have references on environmental friendly farming systems
- test their economic efficiency
- test the relevance of a small territory approach for environmental questions in farming systems

■ The combination of *experimentation at the farming system* level and *multi-objective modelling* might suit that purpose

■ Perspectives

	Small Territory	Farming System
Designing	X	X
Evaluating	X	X
Modelling	X	X

Thank you for your attention

