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## Modeling for decision support and modeling for impact assessment. How do the modeling projects differ?

François Brun

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## Modeling for decision support and modeling for impact assessment. How do the modeling projects differ?

François Brun (ACTA)

RMT modélisation, Seminar September 7, 2010 (Paris)

« What's new, what's next in dynamic system modeling in agronomy »

**Pour mémoire ACTA, le réseau des instituts des filières animales et végétales, ce sont :**

- 16 instituts techniques agricoles qualifiés dont une tête de réseau.
- Les outils professionnels de recherche appliquée et de transfert technologique au service des filières agricoles.
- Une forte présence sur le territoire national avec près de 200 implantations en région.
- Une force de 1100 ingénieurs et techniciens.
- Un budget de 168 millions d'euros en 2007 dédiés à la recherche agricole appliquée.



# Overview

## ➤ Introduction

- French Agricultural Technical Institutes
- Modeling for agricultural development ?

## ➤ Modeling projects for agricultural development

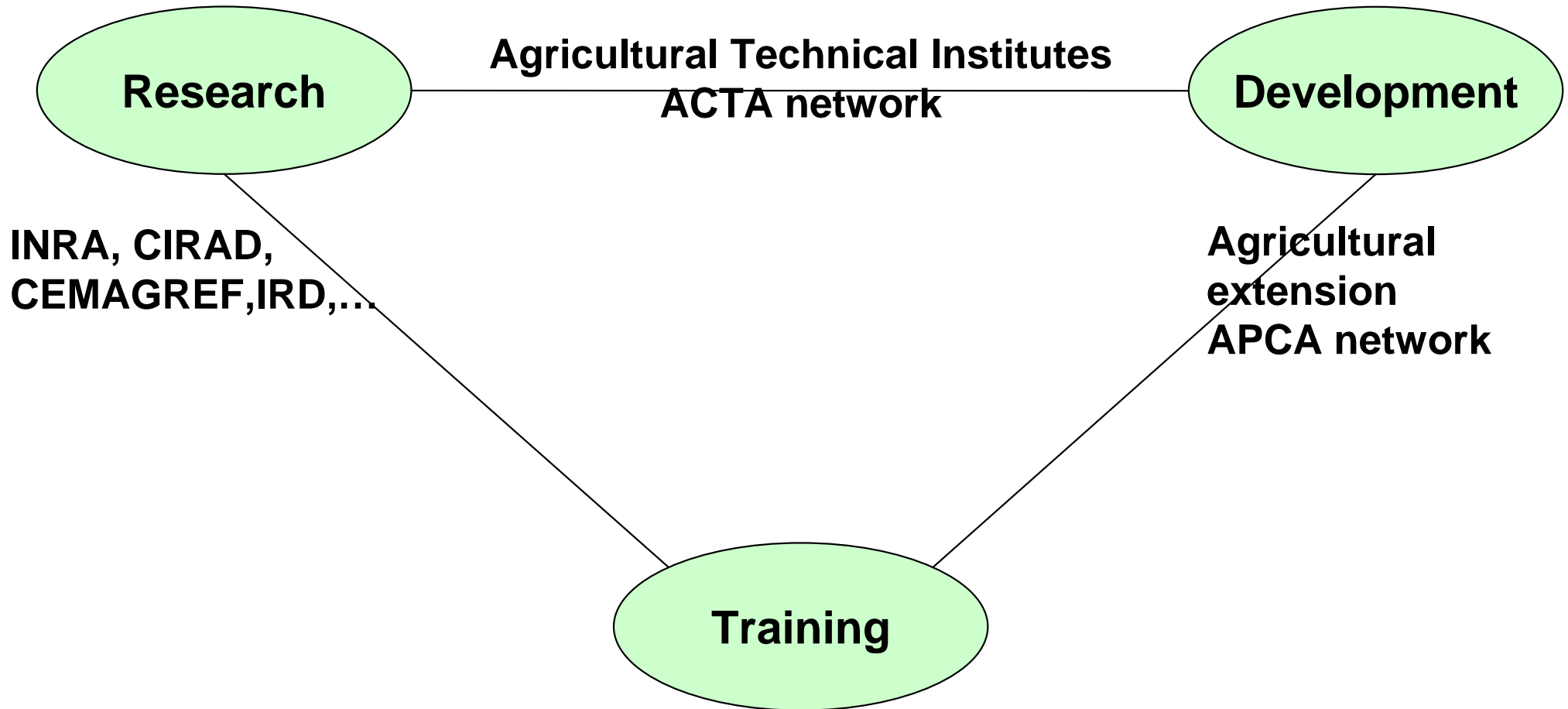
- Phases and stages proposed
- Duration
- Two types of projects and examples
- Software
- Evaluation
- From type 2 to type 1?

# Introduction

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September 7, 2010 (Paris)  
« What's new, what's next in dynamic system modeling in agronomy »

# French Agricultural Technical Institutes



September 7, 2010 (Paris)

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# Agricultural Technical Institutes

## ACTA network

- Applied research, technical support, experiment, expertise, training and information. Operational mission on the field. Creation and dissemination of technical progress in agriculture.
- **Head of network**
- ACTA, coordinator and representative of the **technical institutes of agricultural sectors**
- **Applied plant research**
- ARVALIS - Institut du végétal
- CETIOM, Centre Technique Interprofessionnel des Oléagineux Métropolitains
- CTIFL, Centre Technique Interprofessionnel des Fruits et Légumes
- IFV, Institut Français de la Vigne et du Vin
- AGPH, Association des Producteurs de Houblons de France
- ANIFELT, Association Nationale Interprofessionnelle des Fruits et Légumes Transformés
- ANITTA, Association Nationale Interprofessionnelle Technique du Tabac
- ARTB, Association de Recherche Technique Betteravière
- ASTREDHOR, Association Nationale des Structures d'Expérimentation et de Démonstration en Horticulture
- IDF, Institut pour le Développement Forestier
- IFPC, Institut Français des Productions Cidricoles
- ITAB, Institut Technique de l'Agriculture Biologique
- ITB, Institut Technique Français de la Betterave Industrielle
- ITEIPMAI, Institut Technique Interprofessionnel des Plantes à Parfum, Médicinales et Aromatiques
- ITL, Institut Européen du Lin
- UNIP, Union Nationale Interprofessionnelle des Plantes Riches en Protéines
- **Applied animal research**
- **INSTITUT DE L'ELEVAGE**
- IFIP, Institut du Porc
- ITAVI, Institut Technique de l'Aviculture
- ITSAP, Institut Scientifique et Technique de l'Abeille et de la Pollinisation (ex. CNDA, Centre National du Développement Apicole)

⇒ 1100 engineers and technicians

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# Role of modeling in the activities of Agricultural Technical Institutes

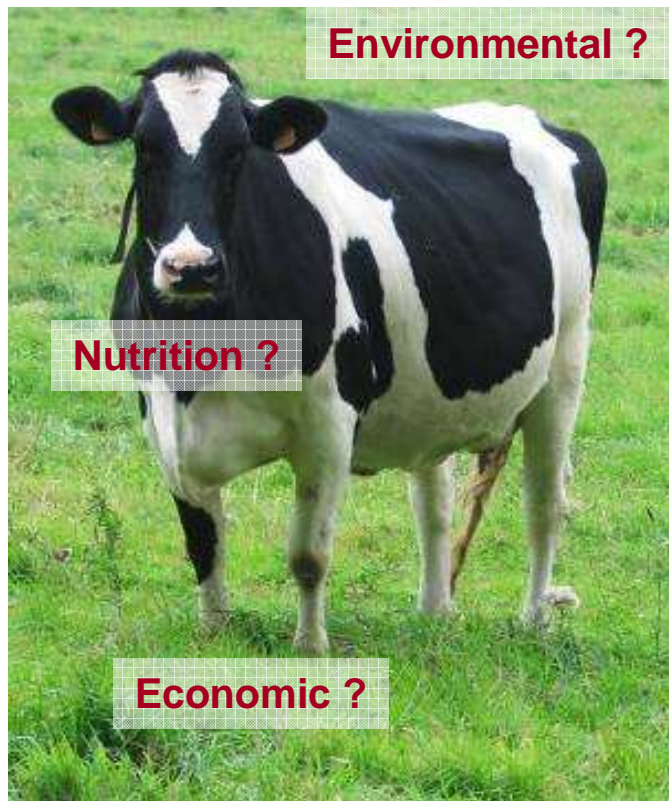


- **Ex.1 : IFV (vine and wine), main modeling themes**
  - **Vineyard protection** against pests and diseases
  - **Yield Quality** : evaluation of potential of a field or year.
  - **Physiology of vine** : information on key phenological stages to predict yield and maturity of grape.
  - **Vineyard soil water status:** drought constraint and global warming impact assessment.

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# Role of modeling in the activities of Agricultural Technical Institutes



## ➤ Ex.2 : Institut de l'Élevage (Livestock), main modeling themes

- **Environment impact assessment :** fluxes (C, N, P, K, Cu, Zn) to water, air and soil. Ex ante and multicriteria assessment of production strategies.
- **Milk production system :** consequences of management on milk production.
- **Technical and economical.**

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## Modeling activity...

- **Existence of a huge quantity and variety of models**
  - => Importance of clarifying what are these modeling works and their place in our community.**
- **The goal of such work is not to construct a model, but to answer a practical issue with a specific purpose.**
  - => Viewpoint of "modeling project"**

# Modeling projects for agricultural development

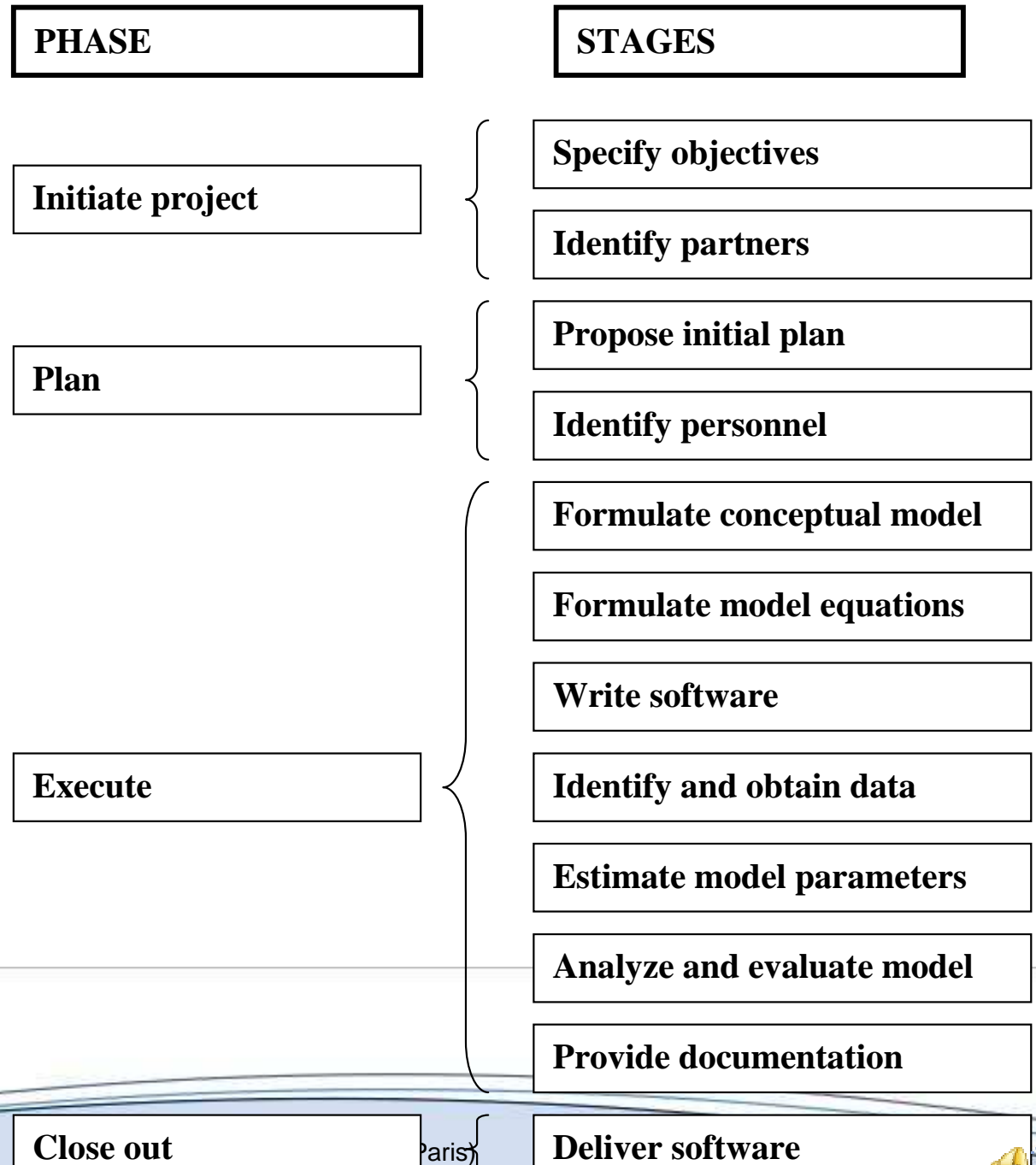
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# Materials and methods

- **A survey of projects of the partners of our modeling network for agriculture (“RMT modélisation”)**
- **Questions on all the project’s steps**
- **Which projects ?**
  - **By or with Technical institute as a partner**
  - **Dynamic system model**
  - **20 projects analysed**
- **Examples:**
  - **Apricot date of yield (CTIFL)**
  - **Wheat Septoriose (Arvalis)**
  - **Sunflower (INRA - CETIOM)**
  - **Environmental assessment Livestock (INRA – Inst. élevage)**

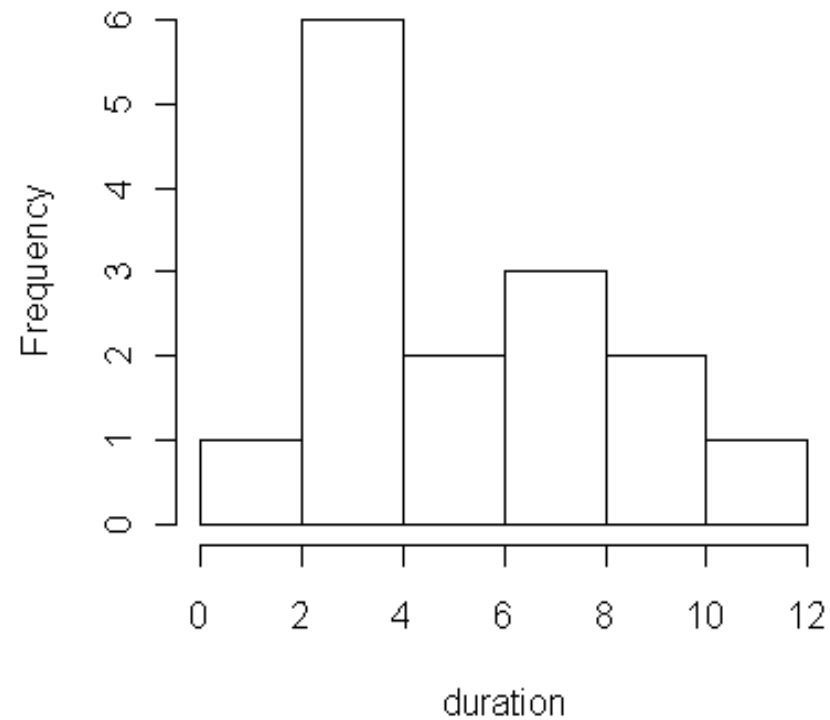
# Phases and stages proposed



A loop process....

# Duration

**Histogram of duration**



# Two types of projects

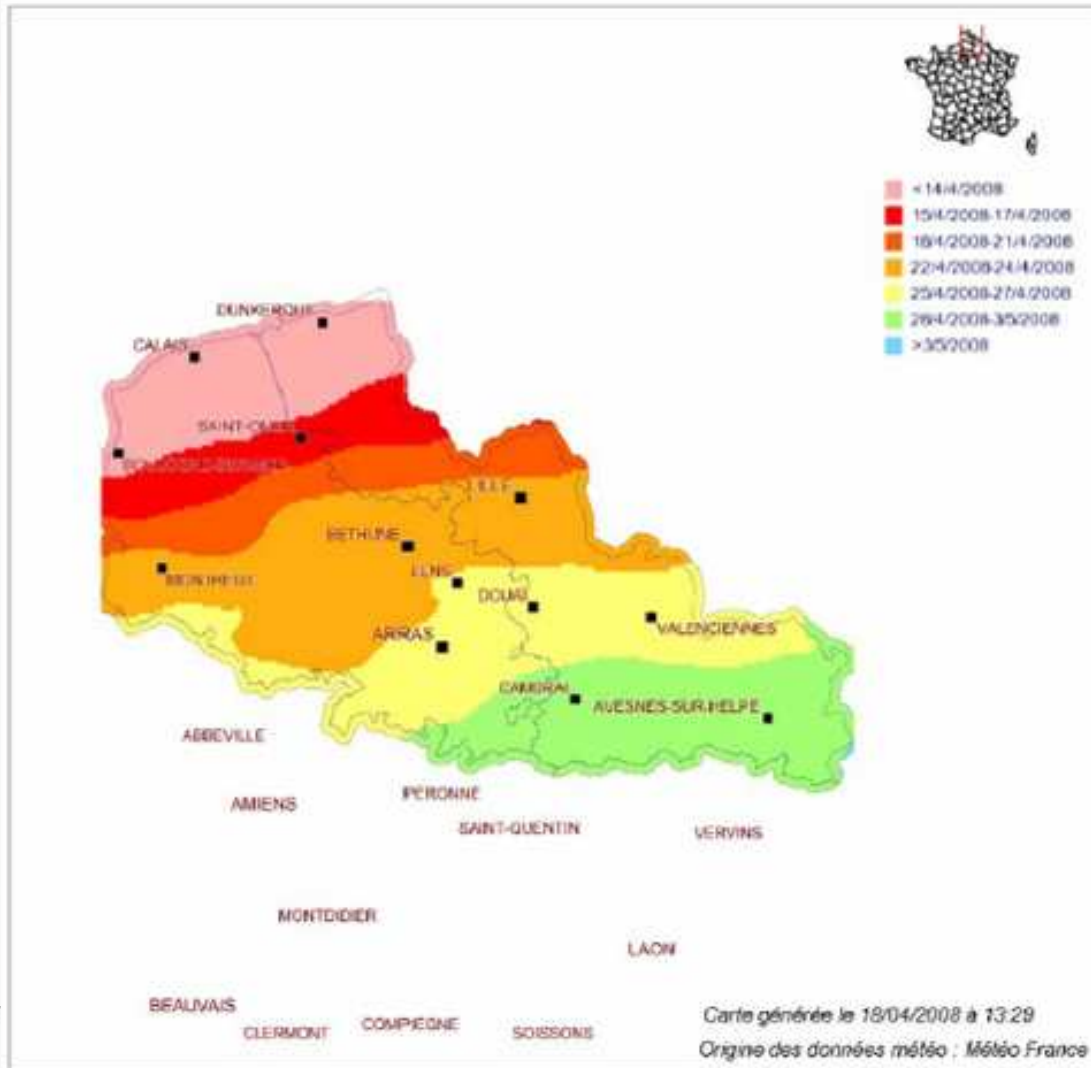
## **Type 1. projects aiming at decision aids for agricultural production systems**

- **For advisers and farmers**
- **Dissemination outside developers**
- **To deal with specific cases**

## **Type 2. projects aiming at assessment of agricultural production systems**

- **For researchers and engineers**
- **Few users**
- **To analyze scenarios**

Variété Dinosaur – semis du 05/10/2007

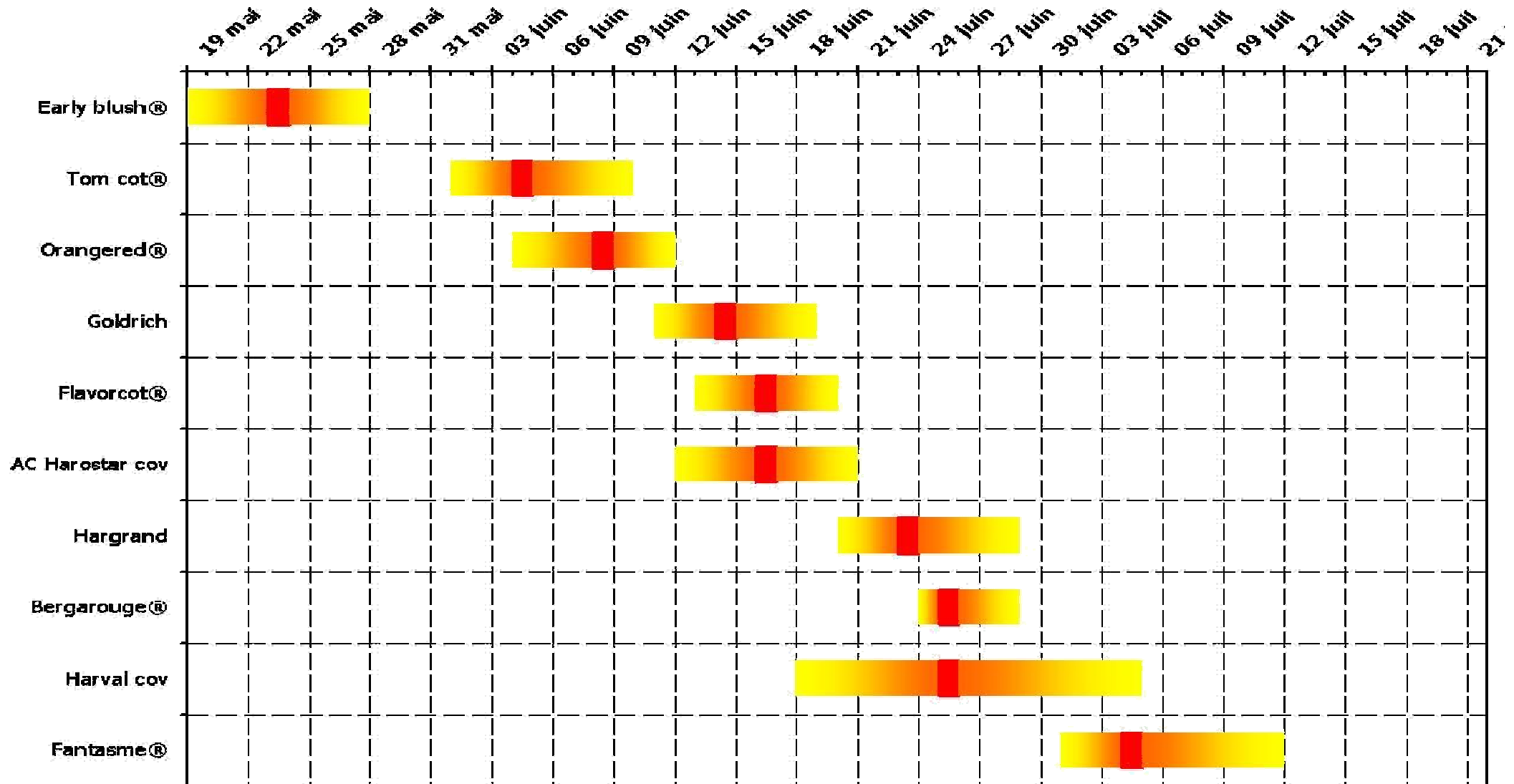


- A clear and operational message provided to farmer
- Real time data
- Regional map
- Suggested date for the first treatment



# Type 1: ex. Apricot yield planning

au 12/10/2009

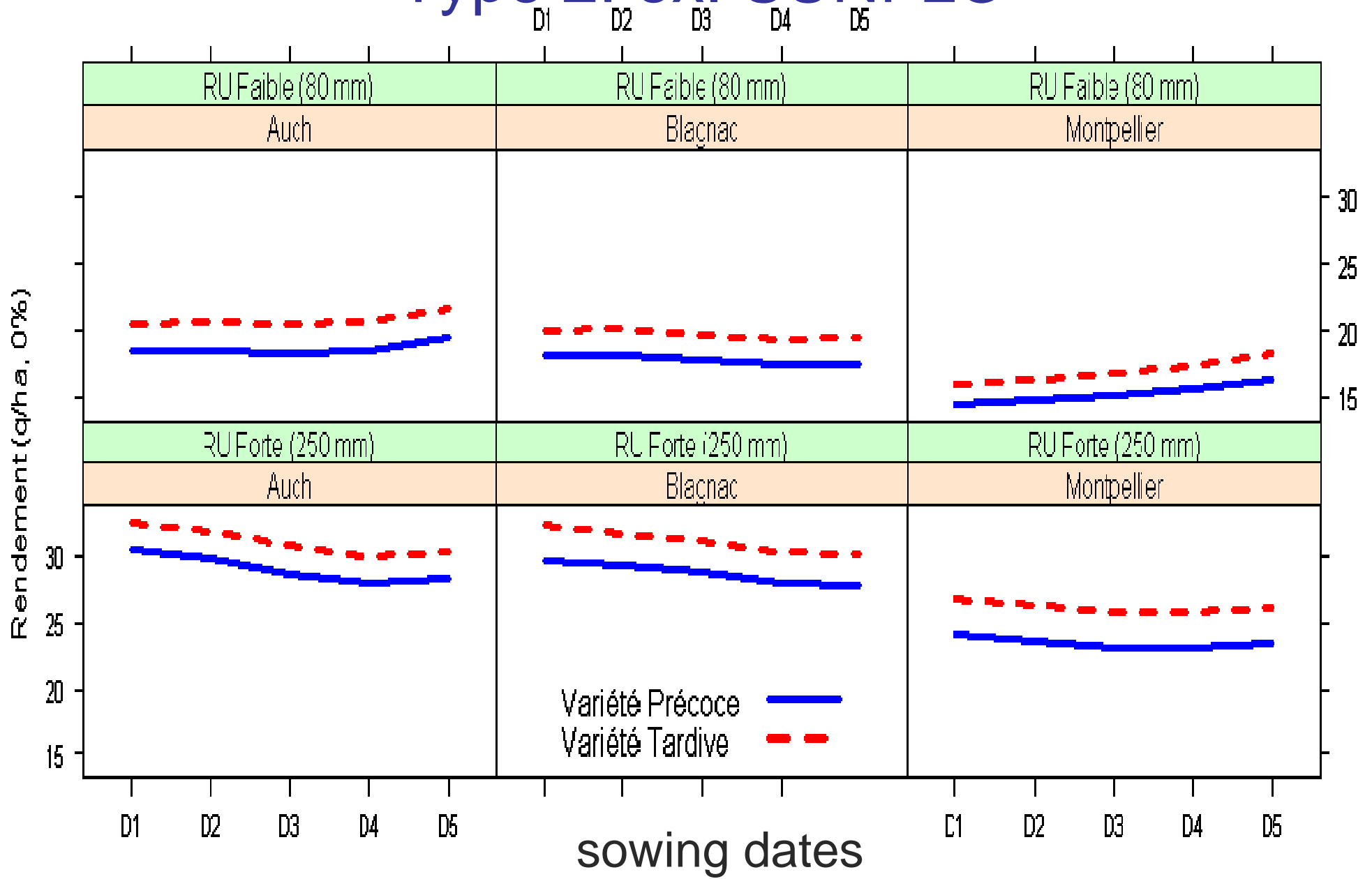


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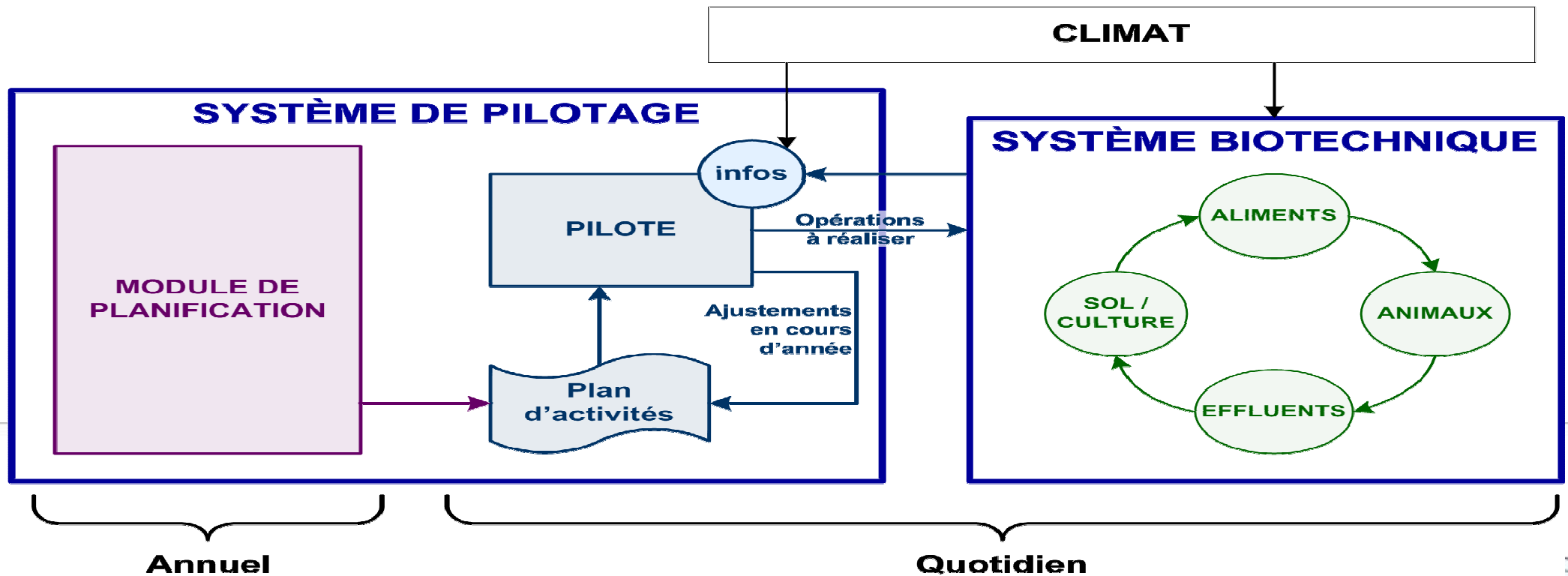
# Type 2: ex. SUNFLO



Variété Précoce ———  
Variété Tardive - - -

# Type 2: ex. MELODIE

- MELODIE model (INRA-IE-IFIP) used to assess environmental impact of livestock dairy cattle or pig
- Scenarios of farm management
- At short (months) and long term (decades)
- Access to variables that can not be measured



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Philippe Faverdin et col., INRA/IE/IFIP

# Partnership

**Type 1. Technical institute, extension services**

**Type 2. Research institute (INRA), Technical institute**

# Modeled system

## Type 1. quite simple

- Ex. disease population

## Type 2. can be more complex

- Ex. disease population + crop growth + crop practices

# Software considerations

## **Type 1. User's interface is an essential point**

- To facilitate real time data (weather)
- Modeling framework for final users

## **Type 2. To get rid of program errors in the model**

- To reuse existing modeling modules
- Modeling framework may be useful

**=> See debate: what role for modeling and simulation frameworks (Hélène Raynal) ?**

# Evaluation

- Type 1. From a representative sample
  - Target Population = conventional management
  - Evaluation representative of future prediction
- Type 2. Using data collected, when available
  - Target Population = innovative management
  - Difficult to have a representative sample
  - Partial evaluation

# Summary of the two types

## ➤ Type 1.

- duration : Several years, mainly devoted to the evaluation of the model compared to real references (networks of observation).
- Importance of quality for prediction OR for decision

## ➤ Type 2.

- duration: Several years, mainly devoted to the design and improvement of the model.
- Importance of the conceptual model

## From type 2 to type 1?

- **It's possible**
- **In some case, it may be expected**
- **We should consider it as a new project (because issue, objective and end-users are not the same)**



# Conclusion

- **All the modeling projects are long and mobilize different skills**
  
  - **the projects can be divided into two types**
    - **projects aiming at decision aids for agricultural production systems**
    - **projects aiming at assessment of agricultural production systems**
  
  - **In general, the same steps in the modeling projects**
  - **The way each step is carried out is quite different, and resources' management should be adapted to the project.**
- => it's really important to clarify the issue and the objective**