Modelling needs for field crops sector

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History

Mars 2000

2005

2009

2013

2018

Lisbon strategy

3% of EU GDP in R&D

French competitivness clusters launched

LES PÔLES DE COMPÉTITIVITÉ
MOTEURS DE CROISSANCE ET D'EMPLOI

Phase 2 for clusters : « projects factory »

Phase 3 for clusters : « products factory »

Horizon 2020

Smart Specialization Strategy

Agriculture 2025

Nouvelle France Industrielle

Nouvelle Région Auvergne Rhône Alpes

French competitiveness clusters: their missions

Anticipate
Scientific, patent, technical, marketing survey

Collaborative project germination
Technical animation Networking

Sustain and assist projects
Funding managment Project managment

Private funding Internationalisation
SME assistance Competencies needs

RESEARCH – TRAINING - INDUSTRIES

Céréales Vallée Cluster
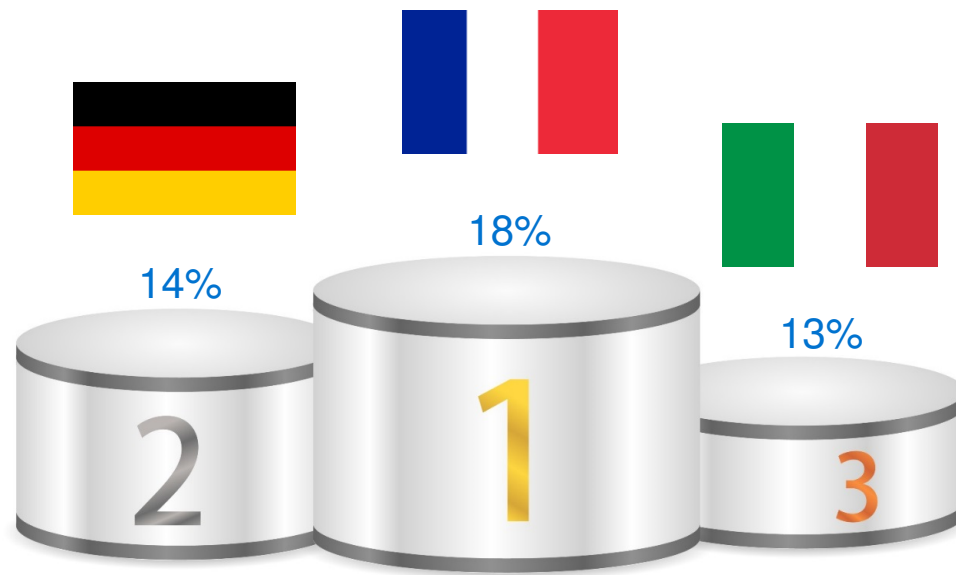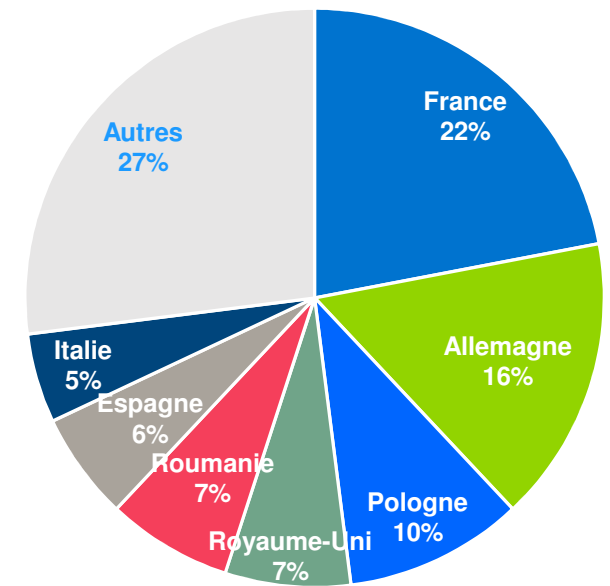
Challenges of the French agricultural production

1st agricultural power

1st grain producer

14%

18%

13%

2

1

3

Breakdown of agricultural production - EU 28
(value)

France
22%

Autres
27%

Allemagne
16%

Italie
5%

Espagne
6%

Roumanie
7%

Royaume-Uni
7%

Pologne
10%

Cereal production by country – EU 28
(volume)

Source: Eurostat 2016

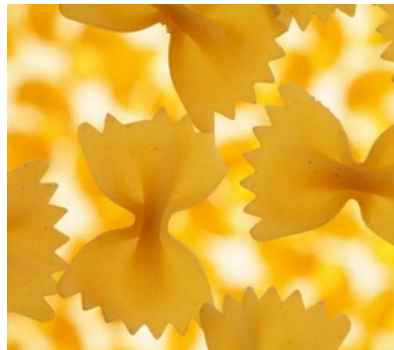# Challenges of the French agricultural production

9,2 billion euros of trade surplus for agriculture

= 76 rafale planes

Challenges of the French agricultural production

70% of French farm production processed by the Agro-food industries

Challenges of the French agricultural production

New opportunities, future-oriented

20% of annual growth for the bio-sourced plastics market

28000 direct jobs in France in vegetal-based chemistry

Céréales Vallée, at the heart of worldwide challenges

Innovating to produce

More
To cope with supply shortages

Better
In line with the economic, social and environmental requirements of sustainability

New things
to produce foods with nutritional design in adequacy with targeted populations

Innovate new applications of renewable carbon

A cluster who enlarges its topic far a whole, sustainable and competitive approach of cereal systems

Economic issue

→ To insure agriculture production resilience

→ To take a chance on new markets opportunity

→ To mutualise R&D

Environmental issue

→ To propose alternative inputs solutions

→ To diversify protein intakes and limit environmental impact of animal productions
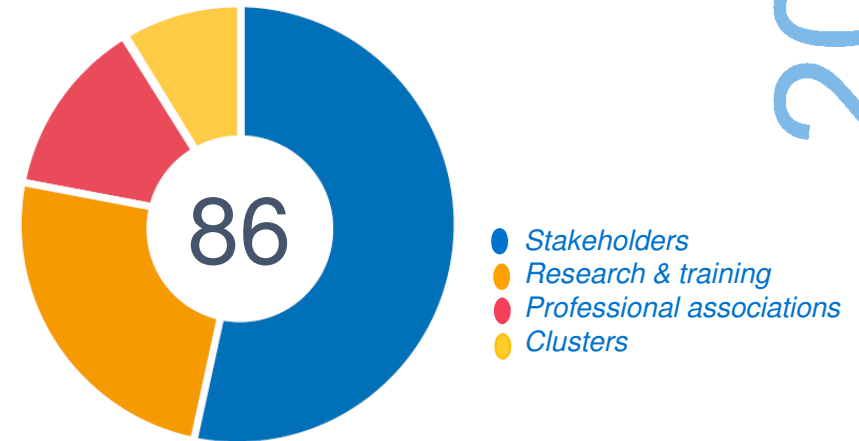
Societal issue

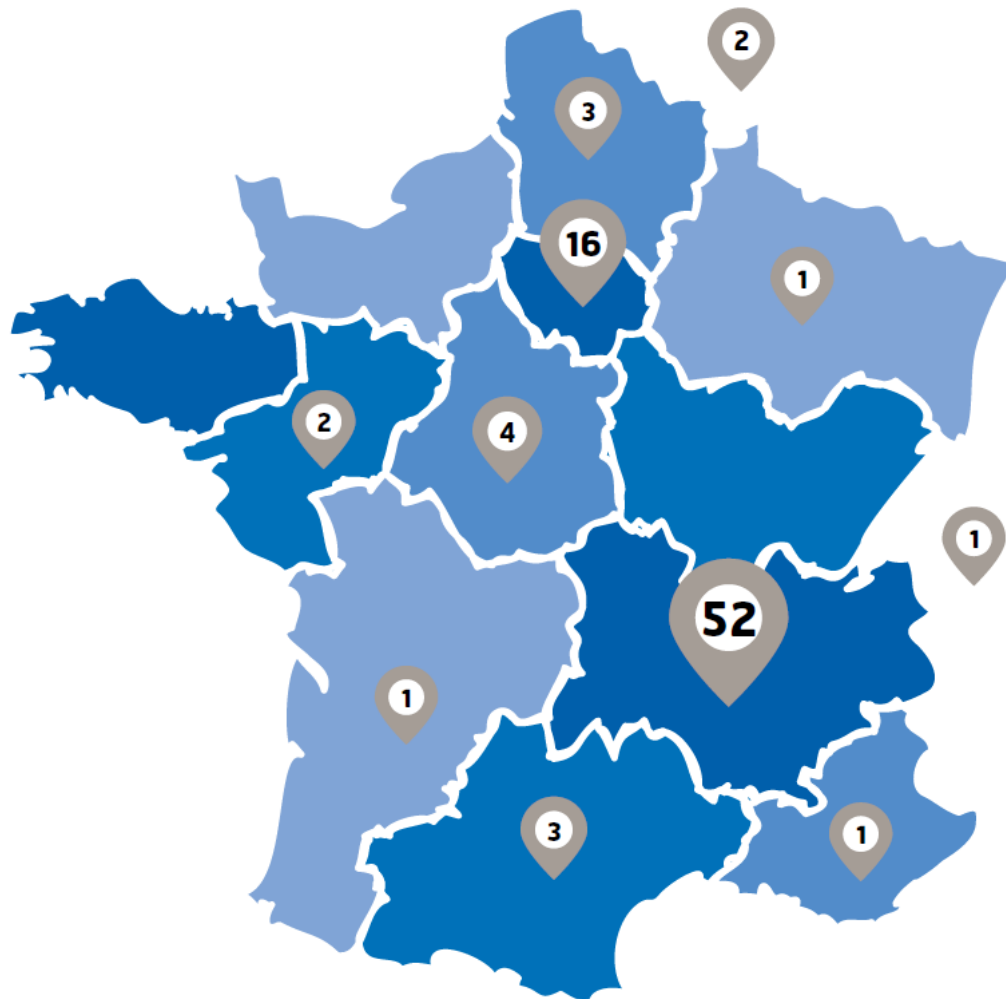→ To fix on territory the high added value activities

→ To create stong link between sectors

→ To favour attractiveness for agricultural, food and feed jobs

10 years of innovation in cereals

10 years dedicated to catalyse innovation in cereal sector

309 Certified projects

556 partners in projects

95 partners out of France

524 M€ projects

76% R&D

15% Training

5% International

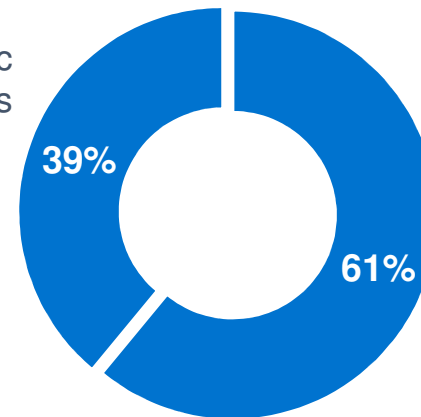**4% Industrial**

Public funds 39%
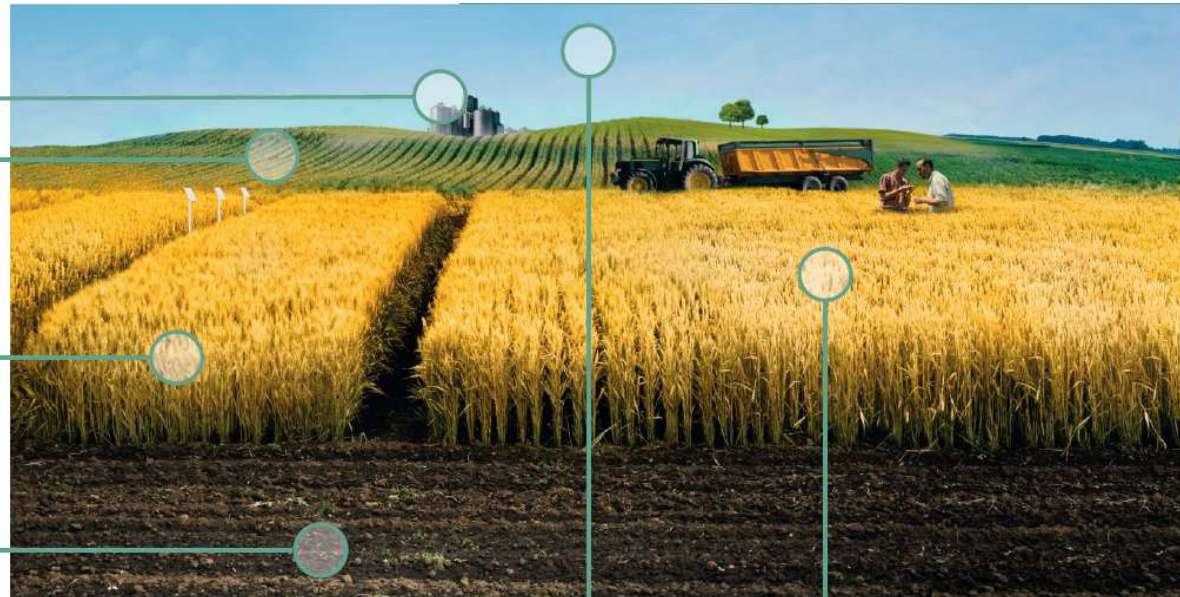
61% Private funds

Optimizing and increasing cereal production

STORAGE AND CONSERVATION

PLANT BREEDING

WATER & NITROGEN EFFICIENCY AND DISEASE RESISTANCE

KNOWLEDGE OF SOILS AND INTERACTIONS SOILS / MICROORGANISMS

NEW TECHNOLOGIES

PLANT PROTECTION AND STIMULANT

Territorial Innovation Lab (LIT) for field crop in Auvergne – Living Lab

Exellence area
For Field crop Pioneer in Europe

- Welcoming space for projects blow-up
- Open and participative innovation
- Co creation with and for farmers
- Involvment of every concerning person in area

- Concept, Design, Diffuse innovating solutions
- Agroécology inspiration

Agricultural equipment

OAD   Training tools

New sectors   Sensors

Organisationnal innovation   Farming practices

Robot   New Products

new varieties

Biocontrol products   Scientific Knowledge
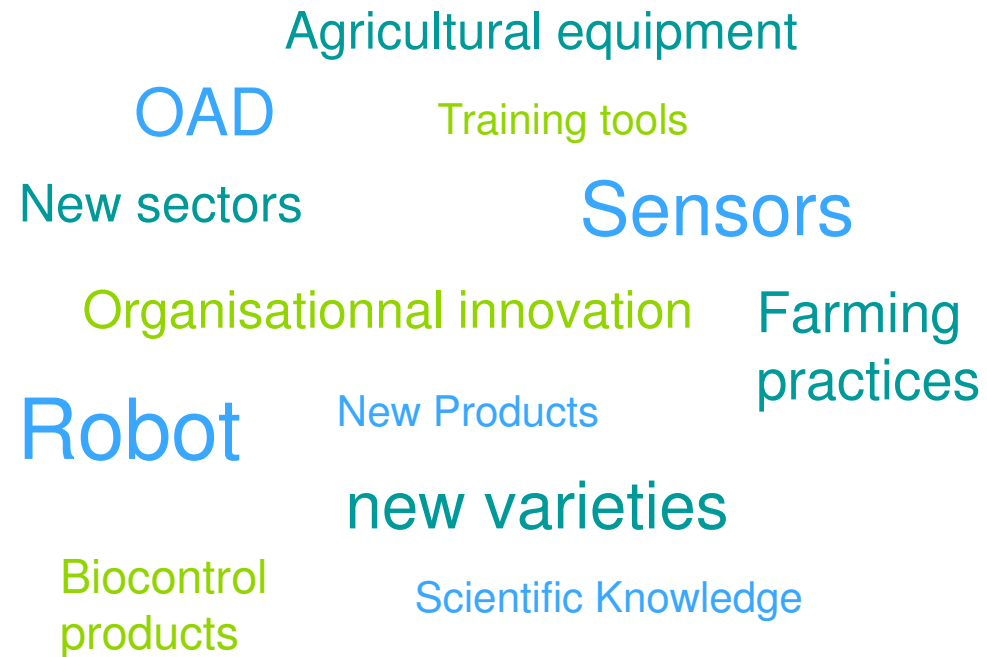
Project examples

- **MOPAD - Micro-Organisms for a Sustainable Agriculture**
  - To develop biocontrol approaches using micro-organisms or micro-organism extracts to control fusarium in bread wheat
  - micro-organisms found in soils (bacteria, fungi, oomycetes) and microbial and micro-algae
  - seed protection, pre-sowing and post-sowing spray treatments in fields

- **PARRASOL – For a renewable and higher rewarding farming through soil**
  - To Produce more, respecting environment, consuming less fuel and inputs, to enhance economic reward, to answer to arable areas decrease, world population increase and quality requirements
  - **Innovative tires** with better traction, lower compaction, added with soil sensors => tools for decision support
  - Math models for soil compaction and plant genetic phenotype

Modelisation needs in agriculture

- **Genetic data management**
  - To detect literature relevant information by numeric automatic systems
  - Combine genetic reading and relevant genomic analysis

- **Precision farming**
  - sensors, signal treatment
  - smart inputs and treatments,
  - climate change management

- **Grain quality managment**
  - Grain filling scheme within plant growing
  - To anticipate grain quality for better transformation

Promoting transformation of cereals into high-quality animal feed and products

MANAGEMENT OF WASTE

QUALITY OF LIVESTOCK PRODUCT

HEALTH AND WELLNESS FOR ANIMALS

HEALTH AND WELLNESS FOR ANIMALS

APPETENCE

RENTABILITÉ DES ÉLEVAGES ET AUTONOMIE DES EXPLOITATIONS

SAFETY SECURITY OF RAW MATERIALS

Project example

- **STIMULUS** – Parietal degradation during Maize feed breeding in France – Study of Histological and biochemical parameters
  - Breeding since 70's : higher and stronger maize plant, more efficient against fall
  - Different parietal structure and nutritional score for milk cattle
  - NIRs Measurements
  - Prediction model of nutritionnal value of feed from histological and biochemical analysis, and further more from genetic profil of maize
  - => Better and quicker breeding

Modeling needs

- **Nutritional value of feed**
  - from biochemical analysis
  - From grain, through processes

- **Image analysis to predict appetize**

Satisfaying basic for needs while balancing nutrition and qualities of use

OPTIMISATION OF PROCESSING

MEETING QUANTITATIVE NEEDS

HEALTH SECURITY

WASTE AND CONSUMABLES REDUCTION

ORGANOLEPTIC QUALITIES

NUTRITIONAL INTAKE

Céréales Vallée

Project examples

- **NOMAC – New resources to control the digestion of cereal products**
  - Low energy cereal product to prevent obesity
  - Predict the in vivo energy intake depending on their structure
  - Gastric emptying and digestion kinetics can be adjusted thanks to natural diversity
  - Starch structure viscosity gastric emptying and glycemic index

- **GRANoFLAKES – to develop innovative solutions in maize sector for cornflakes**
  - Identify the best maize variety for cornflakes processes
  - Modelize components behaviour through extrusion to lead to an optimized cornflakes considering taste, structure and nutrition
  - Predict behaviour of cornflakes in milk (cold and warm)
  - Predict grain composition and structure through different varieties growing

Example: Structure of a maize grain
Quantification of germ, floury and vitrous parts by analysing grain section
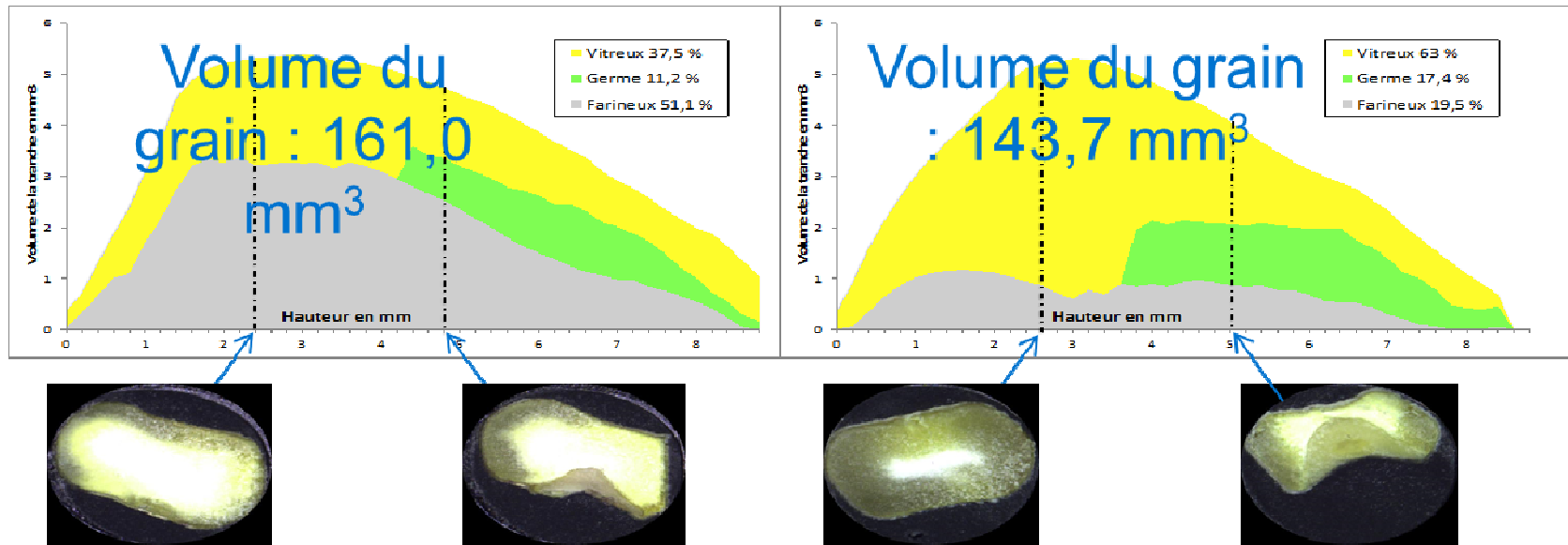
Facilitate quality breeding

Modelling needs

- **To improve product self-conservation**
  - Modellise and predict lipid oxydation process
  - Modellise water and salt transfers

- **Process flexibility and optimisation, higher rate, waste limitation**
  - Cooking: heat transfert, « new » cooking process (microwaves ans ohmic)
  - Surdough behaviour, fermentation step optimisation
  - Predicting dough behaviour in process from biochemical/rheological analysis
  - Oil extraction rate within nutritional preservation

- **Quality prediction**
  - Storage, drying of grain
  - Fail, braking, dust, weight loss

- **Nutritional quality prediction from formulation**
  - Specially for artisanal transformation, collective food cooking

Giving value to a renewable resource

RECOVERING CEREALS CONSTITUENTS

PROCESS DEVELOPMENT
ENVIRONMENT-FRIENDLY

ENSURING A CIRCULAR ECONOMY

DEVELOPMENT OF CHEMICAL
INTERMEDIATE FROM PLANT SOURCES

Project examples

- **ECO-C-REAL – To optimize eco-extraction from bran with natural solvants**
    - Bran contains active molecules specially wanted by cosmetic, pharmacy or nutrition industries
    - Terpens are strong natural solvants (from wood or agriproducts) that can replace hexan

Modelling needs

- **To optimize extraction rate**

- **To anticipate green chemistry processes**
  - Fermentation, Bioconversion…

- **Biomaterials**
  - Technical behaviour
  - Permeability

How to work with Céréales Vallée's members?

How to work with Céréales Vallée?

- Collaborative projects
- Business partnerchip
- PhD co-management
- Preliminary tests…

=> Cereales Vallee will bring you to qualified french industrial partners from cereales and fields crop sectors

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Cluster's team

Thank you!