OUR APPROACH

© Pascal Courtois / Inra

- Supporting research activities, with 5 clusters of projects (Adaptation and natural resources and territories; Adaptation of crops; Adaptation of livestock; Adaptation and biodiversity; Adaptation and animal and plant health).
- Building a community across disciplines, and promoting multidisciplinarity.
- Fostering the use of multi-model ensembles and model comparison regarding the impacts of climate change and greenhouse gas emissions.
- Strengthening dissemination activities and innovation.
- Promoting a leverage effect by funding INRA teams involved in international projects and actions, including ERA-NETs.
- Supporting training, including by co-funding PhD grants and hosting postdoctoral fellows.
- Furthering intra- and inter-communities exchanges through scientific animation.
- Involving INRA partners, actors from different sectors and the economic and institutional stakeholders.

MANAGEMENT

© Anne Jambois / Inra

AAFCC metaprogramme is headed by the Head of the "Forest, Grassland and Freshwater Ecology" division (EFPA), under the authority of Inra's Scientific Director for Environment. AAFCC governance includes a Steering Committee, an international Scientific Advisory Board, and a Stakeholders Committee.

- The Steering Committee: consisting of a team of researchers and support staff, it works in direct interaction with research groups in a co-construction approach, promoting multidisciplinarity. It provides communication and animation to the growing metaprogramme community involved in adaptation to climate change.
- The Scientific Advisory Board: consisting of internationally renowned scientists and chaired by the Inra's Scientific Director for Environment, its purpose is to guide the programme, to suggest research priorities, to identify strategic partnerships, to evaluate the proposals in response to the calls for interest issued by the programme, and finally to assess the added value of the programme.
- The Stakeholders Committee: consisting of representatives from different sectors, from Inra's partners and from institutional stakeholders, it allows to strengthen the relationship with operational actors in the field of adaptation, to inform them on the activities of the metaprogramme, and to take their needs and expectations into consideration.

COMPOSITION OF THE SCIENTIFIC ADVISORY BOARD

• **Umberto Bernabucci,**	Università della Tuscia, Italie	• **Philip Thornton,**	University of Edinburgh, Grande-Bretagne
• **Wolfgang Cramer,**	Institut Méditerranéen de Biodiversité et d'Ecologie Marine et Continentale, France	• **Emilio R. Cerezo,**	Joint Research Center Sevilla, Espagne
• **Michel Dequé,**	Météo-France, France	• **Nathalie de Noblet,**	Laboratoire des Sciences du Climat et de l'Environnement, France
• **Mark Howden,**	Commonwealth Scientific and Industrial Research Organisation, Australie	• **Elias Fereres,**	Universidad de Córdoba, Espagne
• **Christine King,**	Agence Nationale de la Recherche, France	• **Michael Jeger,**	Imperial College London, Grande-Bretagne
• **Franck Lecocq,**	Centre International de Recherche sur l'Environnement et le Développement, France	• **Peter Langridge,**	University of Adelaide, Australie
• **John Porter,**	Københavns Universitet, Danemark	• **Frits Mohren,**	Wageningen UR, Pays-Bas
• **Nathalie Dörfliger,**	Bureau de recherches géologiques et minières, France	• **Jean-François Soussana,**	Inra, France

(2014)

EIGHT INRA METAPROGRAMMES

- **AAFCC**: Adaptation of agriculture and forest to climate change *(Coordinator: Thierry Caquet)* — www.accaf.inra.fr/en
- **DIDIT**: Diet impacts and determinants: Interactions and Transitions *(Coordinator: Jean Dallongeville)* — www.didit.inra.fr/en
- **EcoServ**: Practices and services of anthropized ecosystems *(Coordinator: Guy Richard)*
- **GISA**: Integrated management of animal health *(Coordinator: Thierry Pineau)* — www.gisa.inra.fr/en
- **GloFoods**: Study of transitions for global food security *(Coordinator: Alban Thomas)*
- **MEM**: Meta-omics of microbial ecosystems *(Coordinator: Emmanuelle Maguin)* — www.mem.inra.fr/en
- **SelGen**: Genomic selection *(Coordinator: Denis Milan)* — www.selgen.inra.fr/en
- **SMaCH**: Sustainable management of crop health *(Coordinator: Christian Lannou)* — www.smach.inra.fr/en

ACCAF KEY FIGURES

A budget about **5** million € per year, including operational costs and salaries (2014).

25 projects launched, involving **95** units and more than **300** Inra scientists (2014).

12 Inra scientific divisions involved: Animal Genetics (www.ga.inra.fr/en), Animal Physiology and Livestock Systems (www.phase.inra.fr/en), Animal Health (www.sa.inra.fr/en), Applied Mathematics and Informatics (www.mia.inra.fr/en), Environment and Agronomy (www.ea.inra.fr/en), Forest, Grassland and Freshwater Ecology (www.efpa.inra.fr/en), Microbiology and the food chain (www.mica.inra.fr/en), Plant biology and breeding (www.bap.inra.fr/en), Plant Health and the Environment (www.spe.inra.fr/en), Science for Action and Development (www.sad.inra.fr/en), Science and Process Engineering of Agricultural Products (www.cepia.inra.fr/en), Social Sciences, Agriculture and Food, Rural Development and Environment (www.sae2.inra.fr/en)

CONTACTS

Thierry Caquet: Coordinator
Anne Jambois: Programme manager
www.accaf.inra.fr
accaf@inra.fr

Writing: Cellule ACCAF / **Editorial coordination**: Barbara Lacor / **Design**: UCPC - design studio - February 2015

METAPROGRAMME AAFCC

Adaptation of Agriculture and Forest to Climate Change

INRA SCIENCE & IMPACT

Adapting to climate change

A multidisciplinary approach to cope with the impacts of climate change

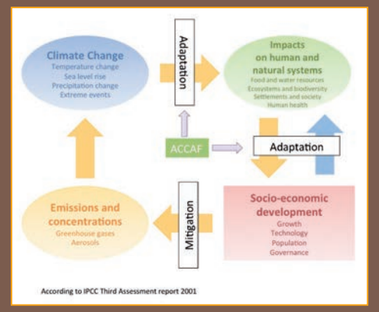
© Stéphane Lehng / Inra

Thierry Caquet
Coordinator

"The fifth IPCC (Intergovernmental Panel on Climate Change) report predicts a rise in temperature with **an increase in climate variability as well as in the frequency and the intensity of extreme weather events**, whose impacts will increase over the coming decades. **A cascade of climate change impacts** is therefore to be expected on water demand and availability, soil quality, pest pressure, inputs' needs, product quality and typicality, agricultural yields and patterns of land use. Climate change interacts with other changes and pressures on ecosystems. **The combined effects of these various pressures must be considered in the context of global change**s.
AAFCC metaprogramme was launched by INRA in 2011 to face these challenges.
It mobilizes **multidisciplinary scientific expertise on adaptation to climate change**.
It has so far supported more than 25 national and international research projects **on annual and perennial crops, livestock, forests, biodiversity, health and water and soil resources**."

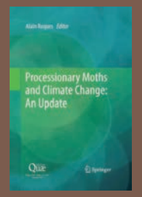
ADAPTATION: A NECESSARY ACTION AT DIFFERENT LEVELS

Climate change has **visible effects,** by contributing for example to the yield stagnation of cereals in Europe in recent years. Agriculture also has an impact on climate change: based on the available measures, specialists estimate that livestock production accounts for up to 18% of greenhouse gas emissions globally.
The proven existence of climate change and the magnitude and diversity of its impacts strongly support the fact that **adaptation is now a necessity for all** to deal with. It appears as a research priority and it should be targeted in combination with the efforts on mitigation of greenhouse gas emissions. Solutions should be proposed in close connection with the whole society and the socio-economic world.
It is necessary, first, to **adapt production and social systems to climate change** and, also, to identify cases where forests, crops and livestock **can contribute to mitigate climate change**.



According to IPCC Third Assessment report 2001

Members of the AAFCC community contributed to the scientific writing of several books on adaptation to climate change (2014).



OUR OBJECTIVES

- **Assessing and managing the risks and opportunities** and **defining strategies** aimed at anticipating and mitigating climate crises.
- **Planning and developing scenarios for the regional impacts** of climate change on agriculture and managed ecosystems.
- **Understanding and controlling the main effects of climate change** on biodiversity and its evolution, as well as on the health of ecosystems, agro-systems and livestock.
- **Genetically improving** cultivated or domestic species and livestock, and **strengthening the resilience** of the different sectors as well as of crops and production systems.
- **Developing innovative adaptation technologies** compatible with reducing emissions and increasing or maintaining the size of greenhouse gas sinks.
- **Identifying the costs and benefits of adaptation measures** in respect of the various issues at stake.
- **Establishing collective organisation systems** that can strengthen the resilience of agriculture and forestry to climate change.

© Hervé le Gac / Inra

Multiple dimensions of work

The issues, or general objectives, of the metaprogramme can globally be ordered according to the increasing response times of the systems, from short- to long-term, and to the intensity and 'active' nature of the adaptation: from palliative or support actions, to innovation and technical or collective organisational breakthroughs.
The actions of AAFCC can also be organized according to an integration gradient ranging from observation to transfer and innovation, and including experimentation and modelling activities and multi-criteria assessment.
In addition to its multidisciplinary nature, the ambition and originality of AAFCC is rooted in the comparative and joint study of major ecosystems and sectors types organized according to a gradient of human impacts and major climatic and ecological gradients.

Integration --> Transfer

Time	Observation	Experimentation and Modelling	Multicriteria analysis	Dissemination and Innovation
Medium-term risks and opportunities				
Regionalised and sectorial long-term projections and scenarios				
Long-term adaptation options				

© Inra

OUR STRATEGY

Adapting sectors to climate change: the multidisciplinary approach at stake

© Fotolia Casablanca / Inra

Elaborating and supporting the process of adapting food systems to climate change are major issues. By its multidisciplinary nature, the approach requires promoting interactions between scientists, development actors and the stakeholders of the concerned sector. Building a common vision of possible futures and key issues for the sector is a vital initial step in the development of prospective scenarios for adaptation. This type of approach is promoted by AAFCC, for example in the case of wine industry.

Taking advantage of the variety of models to better understand the uncertainties

© Aline Raquet / Inra

Using a set of different models for estimating the uncertainty around a projection is a common practice in climatology. Similar approaches, supported particularly in the context of AAFCC international actions, are developing in the field of crop and grassland modelling. The use of multiple models enhances the reliability of the simulation of the impacts of future climate scenarios. These actions also support the comparison and improvement of ecophysiological models and contribute to strengthen the links between modellers at the international level.