

**AGREEMENT BETWEEN  
THE FRENCH MINISTRY OF RESEARCH  
AND THE FOUNDATION « MONTPELLIER AGRONOMIE ET  
DEVELOPPEMENT DURABLE »**

*(Draft English version, for information)*

The 'Research Pact' has made it possible for the scientific community to set up, with financial aid from the State, thematic advanced research networks (*Réseaux Thématiques de Recherche Avancée*, **RTRAs**) to support projects of scientific excellence. Through this, the government wishes to use the best French research units to enhance the emergence of scientific centres of excellence in France that are recognised as being among the very best at the international scale. RTRAs have a core consisting of geographically close research units around which forms a critical mass of very high level scientists federated in the framework of shared strategies and a common scientific goal.

The 'Agricultural Sciences and Sustainable Development' project was chosen to become a RTRA supported by a Scientific Cooperation Foundation. The Foundation was set up by decree (*NOR: MENR0700282D*) on 19 February 2007.

The present agreement between the Ministry of Research and the foundation '*Montpellier Agronomie et Développement Durable*' specifies the terms of the mutual undertaking of the two parties.

The Foundation's undertaking is specified in this document. The latter is based on the file submitted during the selection phase and that is annexed to the current document.

The undertaking of the Ministry of Research takes the form of the payment of 17 million € to the Scientific Cooperation Foundation '*Montpellier Agronomie et Développement Durable*' to enable the community concerned to be a global leader in this sector through the increased visibility, creativity and response ability enabled by the specific resources of a foundation.

The attaining of the Foundation's objectives will be monitored on an annual basis by the *Direction Générale de la Recherche et de l'Innovation* (Ministry of Research and Higher education). The budget, the annual report, the accounts and the updated list of the units involved in the network will be delivered to the Ministry of Research each year.

**1. The Foundation “ Montpellier Agronomie et Développement Durable” (Montpellier Agricultural Sciences and Sustainable Development)**

The project covers the domain of agricultural research and sustainable development, bringing together temperate, Mediterranean and tropical issues.

The founding organizations are the **Institut national de la recherche agronomique (INRA)**, the **Centre de Coopération Internationale en Recherche Agronomique pour le développement (CIRAD)**, and the **Grand Etablissement d'enseignement supérieur agronomique Montpellier SupAgro**. The partners are institutions involved in the RTRA's joint research units, i.e. IRD, CNRS, University of Montpellier II, University of Montpellier I and CIHEAM-IAMM, together with other establishments that are members of the Agropolis International consortium.

The RTRA's geographic zone is formed by a set of research units located in Montpellier and Avignon. Some scientists reporting to these units are on postings in French overseas territories or abroad. A list of the units participating in the RTRA is provided in Annex 1.

## **2. The undertaking with regard to the objectives and strategy of the 'Fondation Montpellier Agronomie et Développement Durable'**

### **a) The scientific lines for joint actions**

The RTRA's aim is to be a top level research centre with enhanced global visibility and attractiveness in plant science, **by assembling teams working at different levels of integration (from the gene to systems), by combining technical science and social science approaches and by bringing together temperate, Mediterranean and tropical issues.**

The work of the RTRA addresses the following major development issues:

- the increasing demand for the use of plants for food and non-food purposes (bio-materials and bio-energy in particular);
- the agricultural adaptation in the North and the South as a response to climate change;
- risk prevention and management: plant diseases, the safety of foodstuffs, the erosion of natural resources and biodiversity, social risks linked to changes in farming systems, etc.

Plants are the central theme of the RTRA and the latter must enable more effective hinging of approaches to address the three following transverse components:

- plants from the gene to the whole plant;
- plants in their biotic and abiotic environment;
- plants, plant products and food and non-food uses.

For this, the network is constructed around two closely connected axes:

- **Axis 1. Integrative Plant Biology (IPB): diversity, adaptation and response of plants to biotic and abiotic constraints.** This refers to increase fundamental knowledge of plants in their environment within the framework of an integrative biology approach linking the different levels of organisation from gene to plant population. The originality of the project lies in the fact that it assembles scientific communities that use two main approaches:
  - i) genetics and genomics, plant improvement and ecophysiology;
  - ii) plant pests and diseases, integrated crop protection and population ecology.

This field assembles the following disciplines and specialisations: genetics, genomics, physiology, development biology, pathology, entomology, ecophysiology, population biology, functional ecology and plant modelling (virtual plants).

- **Axis 2. Socio Technical Dynamics of Innovation (STDI).** This refers to increase knowledge of innovation processes in agriculture, the environment, foods and agroindustries and to use this knowledge together with that generated by research in Axis 1 within a sustainable development context. Corresponding research activities within this axis are in the area of change design, technological and organisational engineering. Multidisciplinary in nature this axis is characterised by a combination of technical and socio-economic approaches towards the social management of innovations. The RTRA is original as it combines teams that

address innovations from a technical angle (i and ii) and from a socio-economic angle (iii) in cross-cutting research programmes:

- i) agri-environmental innovations,
- ii) agrifood innovations,
- iii) social innovations and the social management of innovations.

This domain assembles the following disciplines and specialisations: i) agricultural science and agro-ecology, soil science, functional ecology and population ecology; ii) integrated science and technology for processing plant production (food science, process engineering); iii) economics, sociology and anthropology, management science, law, geography, political science.

The scientific themes addressed within the framework of the RTRA will follow the research priorities announced in the RTRA application file and presented in Annex 2. These themes and priorities can be revisited over the years to make it more responsive to the changing scientific landscape as well as to the challenge raised by scientific evolution, while remaining within the field of operation of the Foundation (agricultural sciences and sustainable development).

## **b) The value-added expected from the RTRA**

The value-added expected from the RTRA is at different scales:

- i) at the scale of the network itself by providing it with the means currently lacking in public establishments for attracting high-level foreign scientists, by encouraging and fostering the launching of research and training projects aimed at creating new partnerships and synergy between teams and by fostering a spirit of emulation among the units that wish to join the network;
- ii) at the scale of the founding organizations by leading them to adopt a joint scientific strategy within the field of the RTRA. This draws benefit from the complementary features in the missions, status and competences of the three institutions in complete coherence with the national policy for closer relations between INRA and CIRAD and in the approach consisting of the setting up of competence centres that closely associate higher education in agriculture and agricultural research;
- iii) at the scale of Agropolis International by strengthening the scientific attraction of the centre for units at the interfaces between downstream agricultural sciences and the upstream academic disciplines. These interfaces are considered as particularly fertile from the scientific point of view and will be favoured sites for action by the RTRA, thus enhancing the overall dynamics of the Agropolis International centre as a whole;
- iv) at the international scale but clearly giving the position of the RTRA as one of the top world centres of excellence in the field of agricultural sciences applied simultaneously to temperate, Mediterranean and tropical environments.

## **c) The principles of action by the Foundation**

- ***Complementarity and subsidiarity.*** Complementarity and subsidiarity with regard to the founding organizations will be used in the conducting of actions.
- ***Leverage effect.*** The Foundation's actions should have a strong level effect with regard to attractiveness and international repute. For this, the Foundation will favour the funding of

'packages' that can have a significant impact: for example, packages combining in a well-defined multiannual scientific project the hosting of high-level scientists, doctoral students and post-doctoral researchers, the organising of major scientific events, the setting up of new activities in research, training and/or use and the production of scientific results.

- ***Excellence.*** The Foundation's actions will ensure first of all the quality of the applicants hosted at all levels (students studying for master's degrees, doctoral students, post-doctoral researchers, lecturers) and the quality of the projects supported. This means that the procedures for calls for applicants and the selection of proposals will be among the components that can be used for appraisal of the excellence of the RTRA.
- ***Interdisciplinarity and transdisciplinarity.*** The RTRA will favour activities (research, training and utilisation) that combine its two main fields, 'Integrative Plant Biology' and the 'Socio-Technical Dynamics of Innovations' and activities combining biotechnical sciences and social sciences. The RTRA will also favour scientific questions at the interfaces with research groups whose disciplinary competences are complementary: soil science and water science, nutrition and health, functional ecology and biodiversity, engineering sciences, economics and social and management sciences, chemistry. Dialogue with these interfaces will be facilitated by the existing organisational features of Agropolis International centre, of which the RTRA is part.
- ***Bringing together temperate, Mediterranean and tropical questions.*** RTRA will favour projects combining approaches used in temperate zones and in Mediterranean and tropical regions that are strongly exposed to environmental risks and are sources of very rich biodiversity.

#### **d) The Foundation's priority actions**

The following priority actions are envisaged, with respect of the principles listed above (complementarity and subsidiarity, leverage effect, excellence, interdisciplinarity and transdisciplinarity and the bringing together of temperate, Mediterranean and tropical questions):

##### ➤ **Attracting a significant number of high-level foreign scientists**

- Hosting of top foreign scientists to launch new themes with the creation of Senior Chairs with the appropriate resources and facilities;
- Hosting of post-doctoral researchers and junior researchers with high potential;
- Offer doctoral studies contracts to excellent foreign students who do not meet the administrative requirements for receiving a research grant from the ministry; increase the number of jointly-supervised theses;
- Propose pre-doctoral grants to enable foreign students to take a 'Master2' degree in France;

##### ➤ **Strengthening international partnerships**

- Strengthen partnerships with the other major centres of excellence in the RTRA's field and with CGIAR international agricultural research centres (IARCs) by providing support for exchanges of scientists and the setting up of joint research and training or utilisation projects within the framework of European and international calls for tenders.

- Propose aid for French doctoral students and post-doctoral researchers on long stays abroad within the framework of strategic partnerships with the other major centres of excellence and international agricultural research centres (IARCs).

➤ **Strengthening international visibility**

- Organise international training seminars and international scientific events (seminars and conferences);
- Promote the scientific activities of the RTRA units through all suitable methods of communication.

➤ **Strengthening training activities aimed at Southern and Mediterranean countries**

- Strengthen training actions for and by research (initial and continuing) for Southern and Mediterranean countries;
- Strengthen training actions (initial and continuing) in collaboration with the international agricultural research system (CGIAR);
- Develop distance learning actions (with support for the Montpellier Languedoc-Roussillon open university);
- Develop the skills of network teams in training systems engineering, training engineering and teaching engineering to support higher education establishments in Southern and Mediterranean countries.

➤ **Amplifying the economic impact of the activities of the RTRA**

- Support the utilisation development actions performed by the founding organizations, and in particular the actions related to 'Q@LI-MEDiterrannée', 'Fruits et légumes' and 'Risques', and international operations by means of the network of researchers and of partners in teams abroad;
- Promote, with coherence with the founding organizations members' utilisation and innovation policies, collaborations with the private sector (companies, NGOs, producers' organisations, etc.) in the North and South that may generate new resources.

The Foundation must set up the appropriate processes and tools to mobilise all the capacity of the RTRA in these actions. In particular, it must enhance the involvement of lecturer/researchers in the research work of the RTRA (in particular by funding releases from teaching tasks) and the involvement of research scientists in activities in training by research.

### **3. Indicators for long-term monitoring**

Indicators for monitoring the objectives are proposed for facilitating the steering of the 'Agricultural Sciences and Sustainable Development' RTRA. They will make it possible to monitor the progress of its work and to compare this progress with that of the largest agricultural research centres in the world. The indicators will be designed to be able to analyse North-South collaboration in particular.

#### ***Bibliometric indicators***

- Bibliometric criteria that are significant in the field (WoS/ISI) drawn up at individual and unit level, consolidated for the whole of the RTRA and including international comparisons.

### ***Indicators of international attractiveness, opportunities and visibility***

- The number of foreign scientists hosted (M2, doctoral students, post-doctoral researchers, junior and senior scientists) and their contribution to the progress of knowledge and the utilisation of results (shown by the number of students trained, the new projects set up, the number of publications and conferences, the number of events organised, etc.).
- The percentage of post-doctoral scientists hosted not having gained their doctorate in one of the founding organizations establishments.
- The geographic origin of the foreign scientists hosted.
- The index of satisfaction of the scientists hosted (by means of an online appraisal system).
- The setting up of a system for monitoring foreign scientists after their stay.
- Partnerships with the other major centres of excellence in the RTRA's field as shown by the new actions supported by the Foundation (exchanges of scientists, joint projects, etc.).
- The number of international scale events organised with the Foundation's support.
- The number of projects submitted to international donors with support from the Foundation and the number of projects accepted. In particular, an indicator of the participation of RTRA teams in the CGIAR Challenge Programmes and the 7th FPRTD.
- An indicator of media impact and the public renown of the Foundation (references in the press, consultation of the Foundation's website, etc.).

### ***Indicators of new partnerships between RTRA units, interdisciplinarity and transdisciplinarity***

- Characterisation of the actions supported in terms of the new partnerships generated (i.e. the mobilisation of scientists and units that did not work together when the RTRA was founded, and in particular collaborations between axes 1 and 2 on the one hand and between biotechnical sciences and social sciences on the other).
- Publications and joint utilisations resulting from these new projects.

### ***Indicators of utilisation, collaboration with the private sector and budget monitoring***

- A list and the description of the features of new utilisation and innovation actions performed jointly by the three founding organizations with backing within the framework of the RTRA (e.g. sets of patents, North/South transfer actions, the design of new joint tools, etc.).
- Fresh collaboration with the private sector (companies, NGOs, producers' organisations, etc.) in the North and the South common to the three founding organizations and supported by the RTRA.
- The development of a financial plan. A financial indicator of the percentage of the funds used for actions related to international operations.

#### **4. Duration**

The present agreement is drawn up for a 5-year period. It will be monitored annually with the Ministry of Research. It can be renewed.

#### **LIST OF ANNEXES**

1. List of the research units involved (*not attached in the English version*)
2. Main axes of development (see attached)
3. Founding organizations members and associate members (*not attached in the English version*)
4. The Board (*not attached in the English version*)
5. The Scientific Council (*not attached in the English version*)
6. Other committees (*not attached in the English version*)

The Chairman of the Foundation's Board  
Henri Carsalade

The Director-General of Research and Innovation  
Ministry of Higher Education and Research  
Gilles Bloch

## **Annex 2. Main axes of development**

### ***Axis 1. Integrative Plant Biology (IPB): diversity, adaptation and response of plants to biotic and abiotic constraints.***

The main lines of research will be as follows:

- Understanding, modelling and mastering plant responses to the constraints of their abiotic and biotic environment. Studies will address the plant functions affected by these disturbances, whether these are to defend against various types of aggression (oxidative stress, pathogens) or major plant functions such as growth, water and ion translocation or the homeostasis of concentrations of elements in cells. The work consists of identifying the functioning of genes that are of interest, analysing and modelling regulation at the scale of organs and the whole plant and describing the genetic variability of such regulation.
- Understanding and mastering plant development in order to inflect it to obtain architecture and development features of interest to agriculture. This combines once again a search for the functions of families of genes, analysis of the regulation mechanisms involved in particular in adaptation to environmental conditions, modelling at several scale (apex, roots or the whole plant) and the identification in genetic resources of alleles that may contribute to the mastery of development.
- Analysing the genetic and environmental determinism of the quality of produce (especially fruits and grains). The approaches are the same as in the two preceding themes and using in particular analysis of genetic and environmental components. It is applied to a specific object, the fruit, and to the various quality components and in particular the accumulation of primary and secondary metabolites, texture (in relation to the rate of maturation and parietal structures) and nutritional quality. Various levels of approach are combined, ranging from the characterisation of sensorial perception by the consumer in relation to the physico-chemical characterisation of the fruits to expression of the transcriptome and proteome in relation with ecophysiological modelling.
- Understanding the evolution of genetic diversity in response to history and environmental and anthropic selection pressures. The data gathered on agricultural species and their models, available germplasm collections and the development of appropriate models make it possible to identify the traces left by selection both in the allele sequence itself and in their frequency within populations. A link can then be established between genotypes and phenotypes in various sample types (species complexes, cartographic populations, natural or artificial populations operating under constraints).

### ***Axis 2. The Socio-Technical Dynamics of innovation (SDTI)***

#### ***SDTI-1. Agri-environmental innovations (the plant in its biophysical and technical environment: agro-ecosystems)***

Collaboration in IPB is structured by three major themes, with the third being more specific to SDTI:

- Modelling crops and the responses of cultivated populations to environmental conditions (genotype-environment interactions). This consists of simulating plant development and growth at field scale in environments with the frequent occurrence of biotic and abiotic stress. IPB modelling teams develop models applied to individual organs and whole plants. SDTI teams use models at the scale of the farmer's field that simulate the performances of plant cover and its exchanges with the environment according to climate, soil and cultural techniques. These models combine knowledge gained in IPB with descriptors of the physical phenomena and the emerging properties observed in experimental plots.

- Modelling population dynamics (linking plant populations and those of biological pests and beneficials). The general aim is that of integrating knowledge linking cultural practices (including pest and disease control practices) organised as coherent cropping systems (in particular in terms of the organisation of work) and the characteristics of the agricultural landscape (the shape and dimensions of fields, the position and function of hedges, wooded areas, ditches etc.) and the functioning of cropping systems with their various components (plants, soil, biological pests, beneficials) with a view to evaluating the 'performances' of these systems in terms of production, plant health and effects on the environment. This type of model, whose relevance has been confirmed by prototypes, is an excellent tool for aid in the design of cropping systems and landscapes suited to integrated production. The modelling work must address the biological processes and interactions within the system (population dynamics, plant population/biological pest pairs) and the way in which agricultural practices and landscape structures have effects.
- Design and evaluation of 'agro-environmental innovations'. Here, the aim is to develop a systemic approach to the cultivated field and its environment from the twin viewpoint of (i) the cultivated ecosystem, whose functioning we seek to understand under the effect of technical operations, and (ii) the technical system consisting of practices used by the farmer. The purpose is that of generating scientific knowledge, models and tools for the evaluation and design of agro-environmental innovations that have been or are to be produced at different spatial scales from field to small production region.

*SDTI-2. Agrifood innovations, product quality and safety (the plant and its uses)*

Five structuring themes are proposed:

- Study of the determinants of the quality of raw material: raw material quality includes its sensorial properties (colour, flavour, aromas and texture), its functions (nutritional or biological function) and its technological suitability (stability, suitability for physical, chemical or biological processing). The aim is to define high-quality markers for the accurate definition of specifications that enable upstream determination of the production conditions that lead to plant raw material of optimum quality.
- Biological reaction engineering (fermentation and the study of microorganisms that produce substances of interest). Research questions concern the optimisation, control and modelling of bio-processes (reactors in homogeneous and heterogeneous media) and the development of specific sensors for online measurement (characterisation and measurement of viable biomass and the morphological and physical condition of cells).
- Process physico-chemistry: priorities include the characterisation and monitoring of the interactions governing supramolecular organisation and the mechanisms involved in the release of compounds of interest such as active substances, nutrients or contaminants in native or developed systems.
- Impact of processes on microbiological safety and functional value: this theme is based first and foremost on the knowledge, utilisation and conservation of bio-active substances (antioxidants and enzymatic antimicrobials, phenolics and aromatics, colorants, minerals and essential fatty acids) and the elucidation of the mechanisms of their action at several scales.
- Development of non-food utilisations and green chemistry using an integrated approach and bottom-up steering of the composition and structural features of plant raw materials (large-scale crops), the optimisation of cropping conditions and the extraction, processing and functionalisation stages.

*SDTI-3: The social, economic and cultural dimensions of innovation processes: social management of innovations*

Research work is aimed primarily at:

- generating original knowledge of the biotechnical, social, economic, legal and political aspects of the great ongoing changes in agricultural and rural societies, with particular emphasis on gaining better understanding of the interaction and combined evolution processes in farming and agrifood systems;
- understanding the actual conditions of implementation by rural societies of the knowledge and techniques generated by the agricultural research sector and the consequences of the innovation processes induced in biological environments and social systems;
- identifying the requirements of agricultures with regard to innovation; this includes technical characteristics and also the social and economic features of these innovations.

The three projects below that are either ongoing or being examined illustrate the type of research that will be developed jointly within the RTRA:

- participative selection of plant species in the Mediterranean region (durum wheat) or the tropics (sorghum, plantain, etc.) according to the quality criteria imposed by regional markets;
- study of the conditions and consequences of the introduction of cultural innovations in countries in the South: conservation agriculture, zero-tillage techniques, direct seeding;
- developing bio-economic models combining agronomic and economic sub-models for decision aid: population dynamics and the management of resistance, biodiversity and genetic resource management.