



# Results of the agriculture 2013 Foresight Study

Objectives and Methodology



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ENVIRONMENT

# INRA



# "Agriculture 2013" Foresight Study

## Objectives and Methodology

**Crédit Agricole, Groupama and INRA decided to carry out the Agriculture 2013 Foresight Study in order to encourage collective thinking and debate by French actors in a rapidly evolving and broadening global and European context.**

**The aim of the Agriculture 2013 Foresight Study was thus to examine the issues and margins for manoeuvre of the Common Agricultural Policy (CAP).**

**Its purpose was to situate thinking on future European agricultural policies in the economic (world growth), commercial (WTO agreements) and environmental (Factor 4, biofuels) contexts, governed by major trends and considerable uncertainties.**

### *Both ambitious and modest*

Ambitious because of inclusion in the analysis of numerous pertinent parameters to understand the dynamics of systems for the production and use of agricultural biomass, as well as the economic, environment and social implications of different possible evolutions in this system. Ambitious also because the analysis is quantitative and has mobilised numerous skills.

Modest because although the proximity of the time horizon retained ("around 2013") has made it possible to achieve reliable simulations using economic models, it has nonetheless been necessary to restrict our ambitions in terms of the different hypotheses explored. For example, the effects of Factor 4 environmental policies are not particularly restrictive at this horizon. In practice, regarding environmental and climate policies, the study has focused on the issue of biofuels. Thus the work presented has generally explored the options currently being debated at the world, European and French levels.

INRA is carrying out two other foresight studies in parallel with this one: *Agrimonde* and *Nouvelles Ruralités* (new prospects for rural living). Because of the time horizons chosen (2050 and 2030) and their objectives – the future of the world food system in the case of *Agrimonde*, and the future of rural areas in France and Europe in the case of *Nouvelles Ruralités* – these two studies are complementary to the Agriculture 2013 project. They enable the exploration of more contrasted trajectories.

In our report on the work carried out in the context of Agriculture 2013, we shall first of all examine the driving forces of the system considered, then the methodology adopted and the scenarios studied, so that the contribution of different models and panels can be described.

# 1. Determinants of systems for the production and use of agricultural biomass

## *A world in movement: future trends affecting demand*

Changes to world demand for agricultural products and consequently orientation of their prices, depend on:

- evolutions in consumption by different populations, particularly in industrially emerging countries and continents where the pursuit of urbanisation and dietary changes are linked to the dissemination of models and strategies for food processing and distribution; these elements define the demand for food, the growth of which depends on world economic dynamics;
- the emergence of a sector for the transformation of renewable carbon, both through the development of a world market for biofuels and bioproducts and resulting from the effects of proactive government policies aimed at reducing dependence on fossil resources; in the long term, energy and environmental concerns may orient the demand for agricultural products used for non-food purposes.

The context of world demand for agricultural products will thus be defined by economic growth via its effects on food needs and energy prices (a prime motor for non-food requirements) and by the level of environmental concerns.

Naturally, uncertainties regarding other parameters may also be important: for example, questions concerning the stock of cultivable land outside tropical rainforests in South America, as well as in Africa, Canada or Ukraine.

Finally, there may be breakdowns in the trends envisaged, linked in particular to the unpredictable temporality of innovations arising from scientific discoveries: the transformation of biomass into biofuels, green chemistry, hydrogen energy, plant breeding, ecological engineering, etc.

## *Regulatory tools: options and uncertainties*

The balance between the supply of and demand for agricultural products, and price structures, are mediated by a variety of regulatory tools that modify the competitive relationships between different actors at the global and European levels, the incentives they perceive and ultimately, their strategies.

Of these tools, the regulations governing world trade and agricultural policies have a major impact on the supply capacity of European and French agriculture. While the outcome of multilateral WTO negotiations under the Doha Round remains uncertain, and the CAP is the subject of considerable debate, we felt it was a priority to consider these two elements as driving forces behind evolutions in European and French agriculture in terms of regulatory tools.

However, both are the subject of debate and uncertainty, and their possible outcomes are precisely what need to be studied in terms of their consequences, their links with global demand dynamics and their uncertainties.

## 2. Study methods

### *2.1. Overview*

To meet these objectives, it was decided to mobilise INRA's capacities for economic modelling, as well as the multidisciplinary expertise of the Institute in agronomy, animal production, environmental sciences, nutrition, etc., in the context of a foresight approach.

In practice, representations and simplified hypotheses concerning the factors governing global demand and regulatory tools (international trade regulations and agricultural policies) were

established, enabling the construction of scenarios as combinations of these hypotheses. The effects of these different scenarios on agriculture, the agrifood industry and the environment were determined firstly, using economic simulation models, and secondly, based on work by specialist panels.

Placing agricultural policies in perspective was then achieved by comparing the situations associated with each scenario: what are the contextual factors for demand and regulation that have the greatest influence on agriculture? Which synergies between these factors are thus highlighted? What are the margins for manoeuvre for government action? What are the conditions necessary for their efficiency or necessity?

This project was carried out in the context of a programme involving INRA's Foresight Unit and economic modelling experts from its Social Sciences, Agriculture and Food, Rural Development and Environment Division (SAE2). A group of experts representing a broad range of skills and professional points of view provided support throughout the process, drawing up scenarios and analytical grids for their consequences, and enhancing interpretations of the results of modelling and panel work through their reactions and discussions.

## *2.2. Hypotheses retained concerning driving factors in the system*

The hypotheses concerned world economic growth, environmental and energy concerns, WTO negotiations in the context of the Doha Round and future changes to the CAP.

### **H1 – Economic growth and changes to global food demand**

*Three alternative hypotheses*

- Slowing of economic growth, particularly as a result of an unfavourable geopolitical context,
- Maintenance of economic growth at the current rate: strong in emerging countries, relatively sustained in the USA and rather weak in Europe,
- Acceleration of growth linked to the increasingly rapid development of emerging countries and a context of stability and cooperation which gives rise to a strong dynamic in favour of trade, investment and innovation.

### **H2 – Environmental and energy concerns**

*Two alternative hypotheses*

- Only the decisions already taken regarding the environment are applied: implementation of the Kyoto agreement; uptake of biofuels according to decisions already taken: the status quo.
- Growth of environmental concerns, both in terms of controlling greenhouse gas (GG) emissions (reinforcement of measures adopted in Kyoto in order to achieve the Factor 4 target) and protection of the environment. In particular, these will result in incentives to use biomass for non-food uses (biofuels and plant chemistry) and new pollution control measures.

### **H3 – International trade regulations (Doha Round negotiations)**

*Two alternative hypotheses*

- "Moderate" WTO agreement (according to the European proposal of October 2005 and including in particular an average -39% reduction in import tariffs and -8% for sensitive products),
- Failure of Doha Round negotiations: status quo or, by contrast, development of ambitious bilateral and regional agreements: EU-Mercosur, Euromed Agreements, APE (Economic Partnership Agreement).

### **H4 – The CAP**

*Three alternative hypotheses*

- Maintenance of current CAP arising from the June 2003 reform,
- Reform of the CAP (reform hypothesis 1) with abolition of the intervention mechanism, full decoupling, a -35% reduction in first pillar direct aids, mandatory modulation at 20% and the transfer of saved resources to the second pillar, abolition of set-aside and milk and sugar quotas,
- Variant of this hypothesis for CAP reform (reform hypothesis 2) with maintenance of the suckler cow premium and milk quotas to take account of the regional importance of cattle breeding.

### 2.3. From hypotheses to the scenarios studied

By combining the different hypotheses put forward for each contextual element, the Expert Committee constructed three scenarios, the principal characteristics of which are presented in the table below.

<b>Three scenarios and their parameters</b>		<b>Demand for agricultural products [world economic growth and non-food uses]</b>	<b>Regulatory tools [WTO and CAP]</b>	
	<b>"Walk" Scenario I</b>	<ul style="list-style-type: none"> <li>- slowing of economic growth</li> <li>- environmental status quo</li> </ul>	CAP maintained unchanged	a- WTO agreement (moderate opening)
				b- no new WTO agreement or bilateral agreements
	<b>"Trot" Scenario II</b>	<ul style="list-style-type: none"> <li>- trend growth</li> <li>- reinforced environmental and energy concerns</li> </ul>	CAP reform (version 1 or 2)	a- WTO agreement (moderate opening)
b- no new WTO agreement or bilateral agreements				
<b>"Gallop" Scenario III</b>	<ul style="list-style-type: none"> <li>- acceleration of growth</li> <li>- environmental status quo</li> </ul>	CAP reform (version 1 or 2)	WTO agreement (moderate opening)	

#### Scenario I - "Walk"

Because of the effects of problems related to the geopolitical environment, economic growth is slowed at a world level, including in emerging countries. In this difficult context, environmental concerns do not evolve. The European Union maintains the CAP according to the current system, i.e., arising from the June 2003 reforms. Pressure increases from countries favourable to the opening of markets, but it is difficult to obtain concessions from the USA and Europe. The effects of such an environment on the result of WTO negotiations cannot logically be deduced. The two alternatives – moderate agreement versus failure of the Doha Round – are thus studied.

#### Scenario II- "Trot"

While economic growth is sustained according to current trends, the build up of concerns related to climate change and environmental protection lead to a reinforcement of measures to control GG emissions and pollution of all types. The European Union pursues its CAP reforms, including notably a strengthening of second pillar measures. WTO negotiations result in one or other of the two hypotheses proposed, which constitute variants to the scenario: moderate agreement or failure.

### **Scenario III – "Gallop"**

Economic growth accelerates, testimony to sustained development in emerging countries, and this dynamic spreads to most countries throughout the world. This accelerated growth creates tensions affecting the prices of agricultural or non-agricultural raw materials. Environmental concerns remain but become a "secondary" factor after worries over the supply of food, which compete with non-food uses of agricultural products. The EU pursues its CAP reforms and WTO negotiations conclude in an agreement.

## **3. Analytical "tools": simulation models and specialist panels**

One major and original aspect of the Agriculture 2013 Foresight Study is that the scenarios proposed by the expert committee were analysed simultaneously using economic simulation models and by specialist panels. The analysis of scenarios using models required certain simplifications.

### *3.1. Simplifications*

It was not possible to consider environmental concerns in their totality. Based on the topicality of debate on these questions, and given the limited abilities of the models employed during this operation to correctly represent the phenomena targeted, a choice was made to focus on the problems of global warming and reductions in GG emissions. Even so, the models used were still unable to process all aspects of these issues. It was thus necessary to narrow the focus even further, first of all by only considering questions concerning the potential contribution of agriculture to GG emissions, and secondly by restricting the effects on French and European agriculture of just two contextual elements that could result from efforts by countries to reinforce their policies to control GG emissions: firstly, a markedly more restrictive post-Kyoto agreement applied to all countries in the world, and secondly, an accelerated development of biofuel production.

Thus scenarios I and III, which correspond to an environmental status quo, provide for maintenance of the current Kyoto agreement and/or (depending on the models and their area of application) development of the production of biofuels in the EU and USA according to uptake objectives that have already been fixed (uptake rate of 5.75% in the EU – 7% in France – attained in 2015). Scenarios II, which correspond to greater environmental concerns, include a "Factor 4" agreement (division by four of GG emissions at the horizon of 2050, with fewer constraints on developing countries) and environmental protection measures.

The Agriculture 2013 Foresight Study thus only deals with a tiny part of what is generally grouped under the title of "environmental concerns", at least when using simulation models. Indeed, these environmental concerns were analysed qualitatively, in the context of specialist panels 3 and 4.

A second, simplified hypothesis was put forward so that the models could simulate the option of a failure of WTO negotiations in the context of the Doha Round, which would result in the development of bilateral and regional agreements between countries and groups of countries. Indeed, there was no question of considering all bilateral and regional agreements that are currently being negotiated throughout the world, even those only affecting the leading agricultural countries. Only a few regional agreements – recently concluded or currently under negotiation – in which the EU is involved and which constitute major challenges for the agriculture and agrifood sectors in the EU, were taken into account: partnership agreements with ACP countries (African, Caribbean and Pacific group of states), the Euromed agreements with countries around the Mediterranean rim and the Mercosur agreements with South American countries.

### 3.2. The simulation models

The Table below presents the different simulation models employed, highlighting their geographical coverage and areas of competence.

*8 simulation models used*

Name of tool	Category	Geographical coverage/ products	Area of competence	Institution
MIRAGE	General equilibrium model	World. Whole Economy	Trade agreements	CEPII (Paris)
GOAL	General equilibrium model	EU-15. Whole economy	CAP reforms	INRA SAE2 (Rennes)
OLEOSIM	General equilibrium model	World. Arable crops and biofuels	Projections Biofuels Agricultural policy reforms	INRA SAE2 (Rennes)
WEMAC	Partial equilibrium model	World. Arable crops	Projections Agricultural policy reforms	INRA SAE2 (Rennes)
OSCAR	Supply model (arable crops French farms)	France. Arable crops and biofuels	CAP reforms Incentive policies for production of biofuels	INRA SAE2 and AgroParisTech (Paris)
MOREA	Aggregate supply model	French regions	CAP reforms	INRA SAE2 and AgroParisTech (Paris)
Accounting simulations	Other quantitative approaches (French farms)	France	Farm incomes, And direct aids	INRA SAE2 (Nantes)
Markov chains	Other quantitative approaches (French farms)	France	Demography of farms	INRA SAE2 and AgroParisTech (Paris)

### *3.3. Specialist panels*

The work accomplished by specialist panels consisted in encouraging members to express their views on themes that were little or poorly covered by the models. Six panels took part in the study, and each dealt with the following points:

- Definition of descriptors for the theme considered,
- State of knowledge on the theme, on current trends and on controversies regarding their interpretation,
- Identification of elements likely to affect these trends,
- Characterisation of the possible impact of scenarios on the theme considered.

#### **Panel 1: Economics of French professional farms**

The work of this panel consisted in a microeconomic interpretation of the impact of different hypotheses under the scenarios; questions of non-price competition were considered, as well as those relative to the effects of price fluctuations, which led to deeper analysis of the management and coverage of risks.

#### **Panel 2: Social dimensions of changes to farming activities in France**

This panel dealt with questions of labour and employment in agricultural activities, and notably the following aspects:

- careers, organisational methods, skills and how they are evolving,
- multiple activities, salaried employment.

Analysis focused on the "economic model" underlying different types of farms. The panel also discussed the role of professional organisations in farming, training, consulting and service provision.

#### **Panel 3: Environment: Water, air and soil**

The panel tried to define the questions by developing indicators relevant to each area; it identified a certain number of factors exerting an environmental impact and studied their trends: climate change, oil prices, and European regulations concerning environmental quality. Transversal questions which rendered the subject more complex were thus highlighted: regional disparities, agricultural diversity and the differential capacity for innovation in different sectors. The question of changes to agricultural practices was also studied, particularly in terms of the impact of the CAP on these practices, and the impact of developments in biofuel production.

The panel identified different effects of the scenarios on the following indicators: the quantities of water used for irrigation, pesticides and nitrates in water, evolutions in the organic matter content of soils, and soil cultivation practices. The panel also mentioned certain indicators that are independent of the scenarios, such as soil erosion and artificial environments for crops, and deplored the lack of knowledge that made it impossible to consider important questions such as methane, ammonia or pesticide emissions into the air.

#### **Panel 4: Environment: Biodiversity and landscapes**

After defining biological diversity and its links to the landscape, the panel defined its indicators: the counting of certain species, plot sizes, heterogeneity of landscapes, cropping system indicators, etc. The evolutionary factors identified by the panellists included climate change, environmental policies and regulations (and notably their links with the CAP), agricultural practices, the production of biofuels and social factors. The parameters considered as being the most important were biofuel production, agricultural practices and the use of plant health products. Major trends independent of the scenarios were also highlighted (climate change, "domestic" biodiversity, reduction in the number of farms).

#### **Panel 5: Product quality and health risks**

This panel focused on the question of food-related health risks: microbiological or toxicological risks, animal diseases and zoonoses, nutritional imbalances and health crises.

Factors for change were reviewed, i.e. the development of trade, production modes (crop management, husbandry systems), climate change and also the perception of risk by consumers. The scenarios were then examined in terms of their associated health risks, detailing contextual aspects of production, types of production and health risks.

## **Panel 6: Processing and distribution of agricultural and agrifood products**

The panel examined firstly, the trends affecting food consumption in France and Europe, and secondly, the strategies adopted by the agrifood and distribution sectors. These strategies concerned the following areas: commercialisation, marketing, communication, supply, import-export and risk management. The factors for change – prices and regulations – were also studied, as were the effects of regulatory changes on GM products.

The effects of the five scenarios were then considered by focusing on each of the strategies defined in terms of their current trends. It appeared that the scenarios differed with respect to the volume of national and world food demand (growth) and environmental constraints (in the broadest sense). The effects of the scenarios were analysed from different points of view: changes to the agrifood industry, food and health, and the question of quality labels.

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