INRAE

Collective scientific assessments, foresight, studies, advanced studies

Direction of collective scientific assessment, foresight and advanced studies (DEPE)
April 2024

INRAE is a national public research organisation under the joint authority of the Ministry of Research and the Ministry of Agriculture and Food.
Within its three areas of expertise - agriculture, food, and the environment - its primary goals are to produce and disseminate scientific knowledge and to contribute to the development of the national research strategy. In addition, INRAE seeks to:

- **Inform public policy and the decisions of economic stakeholders**
- **Participate in scientific-societal debates**

RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

INRAE
la science pour la vie, l'humain, la terre

Missions of DEPE

The Direction of collective scientific assessment, foresight and advanced studies (DEPE) is one of the two units of the General Directorate for Expertise and Support for Public Policies (DGDEAPP). It replaces the former Delegation for Collective Scientific Assessment, Foresight and Advanced Studies, which was created in 2010.

DEPE coordinates the collective scientific assessments, studies, and foresight studies entrusted to or requested by the Unit. It mobilises scientific knowledge to inform public decisions, fuels public debate and promotes discussion on the Institute's scientific orientations.

To this end, the DEPE engages experts from INRAE and other public research and higher education institutions in France and abroad to carry out these operations. It respects the charters and methods that the Institute adopts for the conduct of these operations. It produces public reports under the auspices of the Institute and its various partners, which are disseminated as widely as possible and are subject to open discussion.

Conduct of Operations

Within INRAE, DEPE coordinates the collective scientific assessments, studies and foresight studies assigned to it by the executive management, from the initial referral to the colloquium where the results are presented.

For each project, a committee of experts is set up, with an average of about twenty members. The work of the committee is coordinated by a project leader from DEPE and by one or more scientific leaders. DEPE may also participate in certain projects without directly coordinating them: in this document, the contribution of the Unit to each project is indicated.

Collective Scientific Assessments

A collective scientific assessment (CSA) is a synthesis of validated scientific knowledge in response to a complex question. The latter is addressed in the form of a referral to the Institute (and sometimes to its scientific partners) by public sponsors (ministries, agencies, etc.) in connection with the implementation of a public policy (adaptation of a regulation, public health issues, etc.). The answers provided require a multidisciplinary approach, including in particular the life sciences and social sciences. An analysis of the international academic literature is carried out by a group of scientific experts (researchers and lecturer-researchers from French and foreign public bodies), and the results of the expert assessment, under the responsibility of the Institute and its partners, if any, are intended to shed light on public debate and decision-making. One particular feature of these assessments is that they distinguish between what is already known from research, what questions remain unanswered, what uncertainties are still being investigated, and what knowledge remains contentious and unresolved. They comprise an overview of current scientific knowledge and an assessment of further research needs without, however, making specific recommendations to the sponsors.

 *Available from Éditions Quae*  *On line*  *Video*

In progress: Plastics used in agriculture and food: uses, properties and impacts according to their composition

CSA commissioned by ADEME and the Ministries of Agriculture and the Environment, involving European experts

Thanks to their many interesting physical and chemical properties and their low cost, plastics have been increasingly used since the 1950s. The agricultural and food sector accounts for almost half of the plastics used in France. As these materials have little or no degradability, and are therefore very persistent in the environment, plastic waste accumulates in the environment, even concentrating along trophic chains. The project takes stock of available knowledge on: the uses of plastics in agriculture and food; the properties required for these uses and their development prospects; the characterization of plastics properties according to their composition and during their life cycle; their impacts on continental ecosystems, and their health effects. It analyzes how trade-offs between expected properties can be taken into account in an eco-design approach, in compliance with health standards, and within the framework of European regulations on the use of plastics.

2022: Use of plant diversity to protect crops and control pests

CSA commissioned by of the Ministries of Agriculture, Environment and Research, as part of the Ecophyto2+ plan

The simplification of farming systems in the past has led too both wild and cultivated plant diversity. Yet scientific knowledge acquired over the last 20 years shows that this diversity is a pillar of agroecology and an important lever for regulating crop pests (insect pests, weeds, fungal diseases, viruses, etc.). In the current context, marked by the need to drastically reduce the use of synthetic pesticides, the CSA analyses the potential offered by a wide range of plant diversification practices to protect crops: planting hedgerows, using varietal mixtures, intercropping, agroforestry, lengthening crop rotations, integrating more semi-natural vegetation into the landscape… It also examines the technical, social and economic factors, as well as the political and regulatory factors likely to encourage or, on the contrary, hinder the implementation of this plant diversification by farmers.

Summary Report, Condensed Report, Extended Report

2022 - Impacts of plant protection products and biocontrol on biodiversity and ecosystem services

CSA produced as part of the Ecophyto2+ plan, in partnership with IFREMER

This project updates knowledge of the ecotoxicological impact of pesticides on non-target biodiversity by considering synthetic and natural pesticides, biocontrol products and organisms applied in agricultural ecosystems and in gardens, green spaces and infrastructures (JEVI). The analysis of contamination and impacts on living organisms covers the entire chain of dispersion of products in the environment, from the site of application to marine ecosystems. It also looks at quantifying the ecosystem services that depend on biodiversity affected by pesticides. Finally, the CSA sheds light on methods for assessing pesticides and monitoring their effects, and on remediation options for reducing or managing past contamination.

Summary Report, Condensed Report, Extended Report

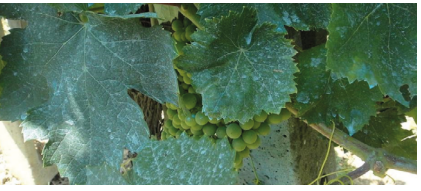
2020 - Quality of food of animal origin in relation to production and processing conditions

CSA commissioned by the French Ministry of Agriculture and Food, and FranceAgriMer

At a time when the consumption of these products is challenged for environmental, human health and ethical reasons, this report examines the various dimensions and determinants of their quality. The consumption of foods of animal origin is being called into question for environmental, human health and ethical reasons. The CSA examines the various dimensions and determinants of quality, broken down into seven properties - organoleptic, nutritional, health, commercial, technological, usage and image - and analyzed for meat, milk, eggs and fish flesh, consumed fresh or processed. This quality is built up, but can also deteriorate, at every stage: animal breeding, slaughter and product processing. Particular attention is paid to products with an official label of quality and origin, as well as to the health effects of consuming food of animal origin.

Summary Report, Condensed Report, Extended Report

2018 - Can we farm organically without the use of copper?



CSA commissioned by INRA's "Sustainable crop health management" metaprogram and the Institut Technique de l'Agriculture Biologique (ITAB)

At a time when organic agriculture (OA) producers are faced with increasing regulatory restrictions on the fungicidal use of copper, it is essential to take stock of alternative solutions (substitute biocidal products, biocontrol agents, genetic crop resistance, agronomic techniques, etc.). Many studies have been carried out experimenting with these alternative methods, but there has been no critical synthesis of knowledge on the subject. The need to combine methods is illustrated in 3 cases: apple scab and mildew on vines and potatoes. While this is a crucial issue for organic farming, which cannot use synthetic fungicides, it is also of interest to more "conventional" growers, who are being asked to reduce their use of pesticides.

Summary Report, Condensed Report, Extended Report

2017 - Eutrophication: causes, mechanisms, consequences and predictability

DEPE provided a methodological support to this expertise led by CNRS in partnership with Ifremer, Inra and Irstea

Eutrophication of aquatic environments is a complex phenomenon caused by excessive inputs of nutrients (nitrogen and phosphorus), leading to proliferation of plants whose decomposition then depletes the environment of oxygen, at the expense of fauna. These major ecosystem disruptions have numerous health, environmental and economic impacts. This assessment provides a critical overview of current knowledge, allowing a better understanding of these phenomena so as to manage them more effectively. In particular, the analysis highlights the need for a risk analysis framework that integrates hydro-biogeochemical transfers and transformations, climate hazards and the ecological vulnerability of receiving environments.

Condensed Report, Extended Report

2017 - Artificialized land and land take; drivers, impacts and potential responses

CSA commissioned by the Ministries of the Environment and Agriculture, and ADEME, in partnership with IFSTTAR

Soil artificialization, the overall reduction in the proportion of land used for agricultural and forestry activities or for natural areas, is now recognized as a threat to Europe's soils. This project examines the difficulties involved in measuring the phenomenon, its impact on the physicochemical and biological characteristics of soils, and the nuisances (acoustic, thermal, hydrological, etc.) associated with waterproofed urban soils. It analyzes the economic and social determinants (housing demand, economic activity zones, infrastructures, etc.) of soil artificialization, and its impact on agriculture and the environment, in order to identify the levers of action likely to limit its development and negative effects.

Summary Report, Condensed Report, Extended Report

2017 - Animal Consciousness

CSA commissioned by the Animal Health and Welfare Unit of the European Food Safety Authority (EFSA)

Current knowledge, summarized in this report, shows that animals possess a wide range of cognitive abilities associated with behaviors of varying degrees of complexity. The forms of consciousness studied in humans imply distinct cognitive capacities found in certain animals. Can we postulate that these animals have forms of consciousness equivalent to those of humans, without necessarily being identical? The study of the levels and content of consciousness in animals is becoming an important scientific issue, given the complexity of the subject and the controversies it is bound to generate. The scientific achievements in this field are an invitation to revisit moral considerations concerning the relationships that humans have with animals (and particularly with domestic animals).

Summary Report, Extended Report

2016 - Cumulative impact of water reservoirs on the aquatic environment

CSA commissioned by the French Ministry of the Environment and with the support of Onema, led by Irstea in partnership with Inra, with DEPE providing methodological support

In France, the number of small reservoirs has multiplied. The creation of new structures now requires a prior study of cumulative impacts on a watershed scale. This study underlines the weakness of existing knowledge and methods for assessing these cumulative impacts. It nevertheless proposes a typology of structures based on their mode of supply, and reviews the functional characteristics of these reservoirs and their consequences on the water flow regime, transfers of sediments, nutrients and contaminants, and the ecological functioning of aquatic environments. This basis is used to draw up a methodological framework, to be discussed with managers and design offices in the operational phase following the CSA.

Summary Report, Condensed Report, Extended Report

2016 - Roles, impacts (environmental, economic and social) and services of European livestock production

CSA commissioned by the Ministries of the Environment and Agriculture, and ADEME

Livestock farming is the subject of numerous socio-technical controversies, notably because of the environmental damage it causes, at both global and local levels. The aim of this CSA is to take stock of scientific knowledge on the positive and negative impacts and the different roles attributed to European livestock farming. It addresses the multiple effects on the environment and climate, the inputs and resources mobilized, employment, sectors and markets, and certain social and cultural issues relating to the production and consumption of animal products. A more detailed analysis of contrasting types of territory (sparsely grazed with high animal density, predominantly grassland livestock farming, crop-livestock cohabitation) identifies "bouquets of services", combinations of (dis-)services rendered by different livestock farming systems.

Summary Report, Condensed Report, Extended Report

2014 - Use of fertilising waste materials in agriculture and forestry

CSA commissioned by the French Ministries of Agriculture and the Environment, in partnership with CNRS and Irstea

The European regulations governing the spreading of fertilizing materials of waste origin (Mafor) on agricultural and forestry soils are evolving. Given this context, which calls for an updated and shared scientific analysis, the report examines the current agricultural use of Mafor in France, its agronomic benefits (fertilization and soil conditioning) and the environmental and health risks associated with spreading (risk of nitrogen leakage, contribution of chemical contaminants, spread of pathogens). It considers ways of optimizing these uses of Mafor, involving the collection of "primary" materials, the treatments applied, the techniques and practical conditions of spreading, transfers between regions, etc.

Summary Report, Condensed Report, Extended Report

2012 - Reducing nitrogen flows from livestock production

CSA commissioned by the French Ministries of Agriculture and the Environment

At a time when livestock farming is increasingly being blamed for the pollution it generates, this appraisal involves inventorying, characterizing and quantifying the nitrogen flows that enter livestock farming systems (purchases of mineral fertilizers, livestock feed, etc.), circulate within them (between soils, crops and animals) and leave them (exported products, leaks into the environment). These leakages, which constitute nutrient losses for agriculture, represent pollution: of water by nitrate, of air by ammonia (whose volatilization has long been underestimated) and nitrous oxide (a powerful GHG). The CSA quantifies these flows for different farming systems, and examines the factors and technical options that increase or could, on the contrary, reduce pollutant emissions, at farm and regional level.

Summary Report, Condensed Report, Extended Report

2011 - Herbicide-tolerant plant varieties

CSA commissioned by of the Ministries of the Environment and Agriculture, in partnership with CNRS

VTHs, varieties made genetically tolerant to herbicides, are presented primarily as a technical response to the challenges of weed control, but also as a means of reducing the quantities of herbicides used. The arrival in France of non-transgenic VTHs raises the question of their compatibility with current environmental objectives, notably the reduction of pesticides and the preservation of biodiversity. The CSA examines the medium and long-term effects and risks of VTH cultivation, in agronomic terms (loss of efficacy due to weed flora adaptation, indirect effects on rotation choices, etc.), environmental terms (impacts on biodiversity) and socio-economic terms (acceptability of the innovation, etc.), and identifies a number of points to watch in order to support the deployment of VTH.

Summary Report, Condensed Report, Extended Report

2010 - Dietary behaviour and practices Determinants, actions and outcomes?

CSA commissioned by the French Ministry of Agriculture

For several years, public policies have been striving to change dietary behavior in a way that is beneficial to health, but their effects remain limited. In order to influence consumers' food choices, we need to know what determines them. This collective scientific assessment mobilizes various disciplines (nutritional epidemiology, physiology of food intake regulation, food science, psychology, sociology of norms and representations, economics, etc.) to understand the construction of food preferences, the low impact of nutritional information campaigns, the benefits of influencing the food supply (availability and composition of products) and combining several levers of action to encourage the adoption of diets more in line with nutritional recommendations.

Summary Report, Condensed Report, Extended Report

2009 - Animal pain
Identifying, understanding and limiting pain in farm animals

CSA commissioned by the Ministries of Agriculture and Research

The issue of pain has been identified as central to the debate on human-animal relations, and this project clarifies the concepts and analytical methods used to understand pain in farm animals. It places the issue in its historical and philosophical context, and interviews specialists in human pain to better understand the specific nature of animal pain, and its components (nociception, emotion and consciousness). The CSA examines the lesional, physiological, behavioural and zootechnical indices of pain, identifies and characterizes painful situations linked to pathologies, rearing or slaughtering conditions and practices, and then considers solutions for eliminating, attenuating or at least relieving such pain.

Summary Report, Condensed Report, Extended Report

2008 - Agriculture and Biodiversity Enhancing synergies

ESCo commissioned by the French Ministries of Agriculture and the Environment

At a time when slowing down the loss of biodiversity and enhancing the value of the ecosystem services provided by biodiversity have become political objectives, this project takes stock of what we know about the relationship between the "natural" biodiversity of agrosystems and agriculture. It examines the impact on various biodiversity components of the intensification and specialization of production systems, associated with the massive use of mineral fertilizers and synthetic pesticides, and the "simplification" of agricultural landscapes. It also assesses the possible contributions of biodiversity to agricultural production processes (yield and product quality, soil fertility, crop pest control, pollination), and examines ways of better integrating biodiversity into agriculture, as well as tools for public action.

Summary Report, Condensed Report, Extended Report

2007 - Fruit and vegetables in the diet
Issues and determinants of consumption

CSA commissioned by the French Ministry of Agriculture

Despite information campaigns promoting the "5-a-day" French consumption of fruit and vegetables, intake of these products is showing little increase, and remains below the nutritional recommendations. The fruit and vegetable market represents a major economic challenge. The CSA takes stock of assessments of the health benefits of fruit and vegetable consumption, and then examines the impact of different production techniques (varieties, cultivation practices), preservation and processing on their nutritional characteristics. The socio-demographic, economic and sensory determinants of consumption are also assessed, as are the tools available for public action to improve supply.socio-demographic, economic and organoleptic determinants of consumption are also assessed, as well as the mechanisms for public action to improve supply.

Summary Report, Condensed Report, Extended Report

2006 - Drought and agriculture
Reducing the vulnerability of agriculture to an increasing risk of water shortage

ESCo commissioned by the French Ministry of Agriculture

The recurrence of episodes of drought, which could increase as a result of climate change, is forcing public authorities to question the capacity of agricultural systems to adapt. This report looks at the relationship between drought and agriculture from two angles: the impact of agriculture on water resources, and the sensitivity of cropping and production systems to water scarcity. It explores possible ways of adapting at plant, crop and system level, assesses the room for maneuver and the limits of these adaptations, and analyzes the organization of water governance in which agriculture is one player among others.

Summary Report, Condensed Report, Extended Report

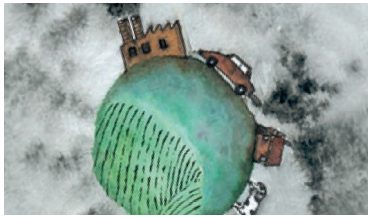
2005 - Pesticides, Agriculture and the Environment
Reducing the use of pesticides and limiting their environmental impacts

ESCo commissioned by the French Ministries of Agriculture and the Environment, in partnership with Irstea

French agriculture, which is a major consumer of crop protection products, is facing the challenge of questioning their use, due to risks to human health and the environment. The project takes stock of available knowledge on the agricultural use of pesticides, their impact on ecosystems, techniques for limiting their dispersion and transfer into the environment, the limits of "reasoned" use in simplified cropping systems that generate high health risks for plants, alternative crop protection methods and strategies, and the public policy tools that can be mobilized to reduce the use of pesticides and agriculture's dependence on these products.

Summary Report, Condensed Report, Extended Report

2002 - Mitigation of the greenhouse effect. Increasing carbon stocks in French agricultural soils?



ESCo commissioned by the French Ministry for the Environment

In accordance with the implementation of the Kyoto Protocol, the Ministry was considering whether to include organic carbon storage in agricultural and forest soils in the national greenhouse gas (GHG) balance. The project takes stock of the importance, variability and dynamics of this storage, for different agricultural or forestry land uses, and for various cropping practices likely to increase soil carbon storage. It examines the difficulties of proving this CO_2 sequestration in soils, the economic policy tools that can be mobilized to promote favorable land-use changes, and the benefits of integrating them into a broader agri-environmental policy.

Summary Report, Condensed Report, Extended Report

Foresight studies

The function of foresight studies is to explore possible scenarios in order to clarify present action in anticipation of future challenges. They aim to debate visions of the future based on representations of the drivers of a given situation (sector of activity, territory, etc.), their interactions, and their possible trends. Foresight studies are based on the development of different scenarios, founded on methods of systematically developing predictions of changes based on the available scientific knowledge of the economic, political and societal conditions that affect the situation to be analysed. Foresight studies produce transdisciplinary insights by drawing on scientific knowledge from various disciplines and on the expertise of stakeholders to provide guidance in anticipating the future.

Available from Éditions Quae *On line* *Video*

2023 - Pesticide-free European agriculture by 2050

Foresight included in the Priority Research Program (PPR) "Cultivate and protect differently", and linked to the European Alliance. Priority Research Program (PPR) "Cultiver et protéger autrement", and linked to the European Alliance « Towards chemical pesticide-free agriculture »

The foresight mobilizes a systemic approach that links the emergence of pesticide-free agricultural systems to the future of food systems, territories, biodiversity, public policies, and the consequences of climate change. It proposes 3 scenarios for agriculture without chemical pesticides, answering two questions. What different forms of agriculture without chemical pesticides could be achieved by 2050, and what would be the consequences for production, land use, trade and biodiversity? What are the possible trajectories towards these forms of pesticide-free agriculture? Each scenario focuses on a different crop protection lever (plant immunity, interactions between plants and microbiota, or landscape organization and management), but also involving different changes in farm and industry structures. For each scenario, yields, impacts on trade, diets and GHG emissions are quantified, and trajectories for achieving them are considered. Four regional cases, located in Italy, Romania, Finland and France, illustrate the scenarios

On line

2019 - Sea level rise, consequences and forecasts to 2100

DEPE co-hosted this foresight study, commissioned by AllEnvi and conducted by AllEnvi's Groupe Transversal de Prospective

The land-sea interface is a fragile zone subject to multiple pressures. The general rise in ocean levels, the extent and long-term effects of which are difficult to anticipate, is likely to have a major impact on coastlines, housing, infrastructure, agriculture, tourism, etc. Based on assumptions for the system's driving components up to the year 2100, the prospective study constructs 8 global scenarios, divided into 3 families, defined by coastal adaptation (through climate control and/or resilience of coastal cities, etc.), denial (leading to a delayed reaction or abandonment of the coastline), or a persistent fragmentation of the world between adaptation in wealthy countries and very deteriorated situations in disadvantaged countries. The project provides avenues for discussion and action relevant to all French researchers involved in environmental issues.

Summary report, Extended report

2019 - What does digital transition mean for higher education and research?

Foresight commissioned by Agreenium and INRA

The transition to digital technology is associated with significant changes - new computing power, increased globalisation, the strengthening of an information society and a digital economy, etc. Often perceived as an opportunity, it raises many questions about the practices and professions involved in research and teaching. It directly affects the research process as well as the transmission of knowledge and expertise. All research processes are impacted, from the collection, storage and perpetuation of information, to experimental and modelling processes, to ways of publishing and disseminating scientific information. The work and working environment of researchers, their tools, and available infrastructure are also affected. Science-society relations are being radically changed by the availability of research data, and citizens are becoming increasingly involved in research on many subjects. This foresight aims to anticipate the changes brought about by the digital transition in agronomy, food, the environment and animal health.

Summary report, Extended report

2017 - Prospect'Agrum Visions for the future of the Corsican citrus sector

DEPE brought methodological support to this prospective study led by the Inra Corsica center

The Corsican clementine (20,000 tons per year, as opposed to 2 million in Spain) is the product of a small but dynamic production basin, which has gone through difficult times, before achieving economic success thanks to differentiation through quality, the abandonment of the productivist model and the granting of a Protected Geographical Indication (French label IGP) in 2007. To help the industry prepare for the future up to 2040, the forecast envisages five scenarios, conditioned respectively by: conversion to organic farming; the destructive arrival of a pathogen; the emergence of a marketing monopoly that standardizes and concentrates production; the gradual integration of the industry, weakened by competition, by supermarkets, or a collective strategy emphasizing quality, terroirs and the IGP.

Summary report

2017 - Research, innovation and development in agriculture: future possibilities

DEPE provided methodological support and monitoring for this prospective study, conducted by ACTA in partnership with Inra, Institut de l'élevage, Terres Inovia and APCA

The foresight project aims to strengthen the ability of players in the French agricultural R&D system to adapt and anticipate, by providing them with a cross-sectional analysis of potential developments in the system, in the light of different trajectories that French agriculture could follow up to 2025. The major consequences for R&D and its organization are set out for four scenarios, exploring contrasting futures in the social, economic and political context: the priority given, in the face of global challenges, to the ecological and energy transition; European support for an agriculture that exports quality products; the European choice of an agriculture at the service of an exporting and regulated industry; the liberal development of a corporate agriculture without state regulation.GIS Relance Agronomique and in partnership with INRA (UMR Cesaer and the SAD department), the French livestock institute (Institut de l'élevage), Terres inovia and APCA.

Summary report, Extended report

2016 - Agrimonde-Terra - Land use and food (in)security

Foresight coordinated by INRA and CIRAD

The foresight continues the work of Agrimonde (2006-2009) and explores, at regional and global scales, how food security could be ensured by 2050, taking into account possible changes in land use. The analysis combines qualitative approaches and quantitative simulations of regional and global food balances. The analysis combines a qualitative approach with quantitative simulations of regional and global food balances. Five scenarios for the evolution of agricultural and food systems are considered: development of megacities and nutritional transition driven by global agribusinesses; development of medium-sized cities and regional food systems based on traditional diets; strong individual mobility between rural and urban areas and emergence of hybrid diets combining traditional and modern value chains; shift towards healthy diets; development based on rural communities and management of common agricultural assets to ensure food security.

Summary report, Extended report

2016 - Ruminant meat sectors in the Massif Central by 2050

DEPE provided methodological support for this prospective study, led by the Inra Auvergne-Rhône-Alpes center

The foresight project aims to shed light on the future of meat production in the Massif Central and the role of ruminant livestock farms, which use large areas of grassland, in regional development. The aim is to help local players anticipate possible futures and, where appropriate, adapt to them. Five contrasting scenarios have been drawn up, combining different changes in demand (a more or less sharp drop in meat consumption, the search for agro-ecological production, etc.), the adaptive strategies of players in the massif (quality certification, adapting production to export markets, etc.) and the foreseeable consequences for sectors, farms and the region.

Summary report, Extended report

2016 - Guadeloupean agriculture by 2040

Foresight carried out by a consortium coordinated by Inra Antilles-Guyane, with methodological support from DEPE

A participatory exercise mobilizing a multi-disciplinary, multi-sector working group, foresight defines Guadeloupe's agricultural system up to 2040 through analysis of a set of driving variables, their past trends and their current state. On this basis, evolution hypotheses for each variable, and then 5 possible scenarios for the evolution of local agriculture are constructed. They highlight, respectively: a decline in agriculture and increased food dependency; the development of agribusiness and the end of peasant farmers; priority given to sugarcane as the basis for rural development; remuneration of agriculture based on the management of biodiversity and ecosystem services; an agro-ecological shift towards local, high-quality food.

Summary report, Extended report

2012 - The French horse industry to 2030

Forecast produced in partnership with the French Horse and Riding Institute (IFCE).

The aim of this foresight of the entire French horse industry is to help industry professionals prepare for future developments, and also to improve the supply of services, knowledge and innovations in a context of restructuring public services. The project takes an original look at the industry through four highly contrasting scenarios, based on opposing trends in the economic context - favoring broad access to equestrian leisure activities or, on the contrary, limiting riding to the elite - and on changes in society that give a different place to the horse depending on whether they favor quality of life and solidarity (the horse contributing to the upkeep of spaces, a vector of social ties), or concern for the well-being of animals (the horse as a life companion).

Summary report, Extended report

2012 - The Landes de Gascogne forest to 2050

Joint forecasting by the Aquitaine Regional Council and INRA, led by DEPE

The project aims to provide support for public decision-making, while at the same time reflecting on how territories can adapt to global change. It seeks to anticipate the challenges facing the Landes de Gascogne region and its forests, in order to inform public action. Four development scenarios to 2050, set against a backdrop of contrasting territorial futures (continued peri-urbanization, attractiveness of coastal areas, etc.), envisage a number of possible futures for the forest and the wood industry, differing in terms of the management and diversity of stands, the organization of the timber industry and the markets targeted, and influencing the biophysical vulnerability of the forest to climatic and health hazards.

Summary report, Extended report

2010 - ENDURE: Crop protection in Europe in 2030

DEPE provided methodological support for this foresight study, conducted within the framework of the ENDURE European scientific network of excellence

Conducted within the framework of the ENDURE network, which aims to make farming systems less dependent on the use of pesticides, the foresight examines the possible futures of crop protection in Europe up to 2030. It proposes 5 scenarios for the evolution of European agriculture, resulting in differentiated control methods that will favor the use of phytosanitary products, the search for innovative technologies, cropping systems intrinsically less vulnerable to pests, the mobilization of natural processes and biodiversity to manage pest populations. These scenarios provide a basis for discussion of future regulatory changes, technological advances and new practices, plant protection research needs, society's expectations, etc.

Summary report, Extended report

2010 - Agrimonde
Scenarios and challenges for feeding the world in 2050

Foresight coordinated by INRA and CIRAD

The foresight explores the possible futures of agriculture and food in the world in 2050. It seeks to identify the fundamental questions that agricultural research will have to address, in order to provide CIRAD and INRA with the means to anticipate and prepare for the future in terms of the structure and direction of public research. The exercise has developed a quantitative analysis tool that enables us to establish, for a country, a group of countries and the world as a whole, balances between food biomass resources and uses, and to simulate the effects of prospective hypotheses (concerning land use, productivity, demographics, diets, trade, etc.). Agrimonde offers 2 scenarios up to 2050, one trend-based and the other breakthrough, aimed at the sustainability of agricultural and food systems.

Summary report, Condensed report

2010 - VEGA
Non-food uses of plant biomass in 2050

Foresight conducted as part of the VEGA foresight workshop on "What sustainable plants and production systems for biomass in the future?", and funded by the French National Research Agency (ANR).

The prospective study proposes the construction of scenarios for future non-food uses of plant biomass by 2050, on a global scale, and explores possible uses for energy and for use in chemistry It highlights the importance of societal, environmental and geopolitical issues, as well as the key role of public policies and the diversity of possible innovation models for a socio-ecological transition. Each scenario is analysed from the perspective of spatial tensions between food and non-food uses of biomass and the sustainability of production systems. Taken as a whole, the scenarios show strong possible tensions on agricultural land surfaces, possible competition with food uses and potential impacts on the environment.

Extended report

2009 - The French poultry industry in 2025

Foresight commissioned by ITAVI

Faced with increased competition in a context of plateauing consumption, French poultry meat production has fallen by 20% in 10 years. This foresight study focuses on broiler poultry farming, and constructs four contrasting scenarios, in which the French poultry industry is caught up in globalization, becomes a pillar of the European poultry industry, commits to sustainable development, or finds itself involved in global regulation of agricultural trade. This exploration of the future up to 2025 highlights the challenges for the future and the scope for action for French poultry industry stakeholders, in order to promte or avoid specific developments.

Summary report, Extended report

2008 - New ruralities in 2030

Foresight commissioned by Inra

The foresight study identifies mobility in town-country relations, economic dynamics in the countryside, governance of rural territories, and natural and heritage resources as the driving forces behind changes in rural areas. By combining hypotheses on these variables, it imagines new forms of rurality that could appear in rural areas. Four scenarios are proposed, in which the future of the countryside is closely linked to urban dynamics. These scenarios are compared with four regional case studies. They are also discussed with researchers, one of the aims of the project being to identify the research challenges associated with these possible new ruralities.

Summary report, Extended report

2007 - Agriculture 2013

Foresight carried out on a joint initiative by Crédit Agricole, Groupama and Inra

The study, part of the European calendar for the CAP Health Check (2008) and the Union's post-2013 outlook, aims to explore possible futures for EU and French agriculture in this timeframe. The foresight proposes three families of scenarios, combining several options for the CAP's evolution, different rates of global economic growth, and the development of biofuels. Their consequences have been quantified using 8 economic simulation models. The project invites debate on the objectives of a European agricultural policy, before considering the tools to be implemented as part of the next CAP reform in 2013.

Extended Report

Advanced Studies

Like the collective assessments, advanced studies are conducted by a multidisciplinary committee of scientific experts. They generally have a narrower scientific scope than ESCos and provide more direct, practical answers. To this end, they draw on sources of information other than the scientific literature (reports, technical journal articles, etc.) or include additional data processing (statistical analyses, simulations) carried out by experts.

Available from Éditions Quae *On line* *Video*

In progress: Environmental labelling. The impact of label food production methods on biodiversity

Advanced study commissioned by Ademe and the Ministries of Agriculture and the Environment, in partnership with Ifremer

Environmental labelling of food products aims to provide consumers with information on the environmental characteristics of products offered on the market. To date, Life Cycle Assessment (LCA) seems to be the most suitable and operational method for obtaining environmental indicators for food products. However, it is not sufficient to understand the impacts of food consumption on biodiversity. The study focuses on labelled products, and examines the scientific knowledge available concerning the effects on biodiversity of the production practices specified in the production specifications. Some 15 labels for agricultural and fishery products are analysed.

Summary Report, Condensed Report, Extended Report

In progress: Soil quality indicators

Study commissioned by INRAE GIS SOL, with funding from Ademe, OFB, and the Ministries of Agriculture and the Environment

With growing awareness of the contribution of soils to ecosystem services and the dangers associated with their degradation, scientists are proposing various conceptual frameworks for defining quality criteria and the indicators needed to assess them. These criteria can cover concepts such as fertility, threats, soil health, soil safety, functions and ecosystem services .... Which are most appropriate? Few studies have tested their application, or demonstrated their operationality in different contexts and for different soil uses (agricultural, forestry, urban, polluted soils...). Today, we lack a global vision of the needs and indicators of soil quality, and this study aims to provide an answer.

2022 - Environmental sustainability of farming systems

Advanced study carried out as part of the OECD's TempAg network (The international sustainable temperate agriculture network), involving European researchers.

This advanced study follows on from an initial assessment by the *TempAg* network of three types of environmental indicator: life cycle assessment, ecosystem services assessment and *yield gap* analysis (between quantity produced and production capacity per hectare). The aim of the project is to build a unified conceptual framework for the environmental assessment of agricultural systems, from the farm to the national scale, combining these three types of indicators. The target application is the environmental assessment of the European Union's agricultural policies. The analysis is based on a documented example of the evolution of agricultural practices: the generalization of nitrate trap intermediate crops.

Extended Report

2020 - The role of European agriculture in world trade by 2050

Study commissioned by Pluriagri, a think tank for the field crop sector

Following on from the advanced study devoted to the food system in the North Africa / Middle East region (2015), this study looks at the evolution of European agriculture's place in the world and economic performance up to 2050, in a context marked by climate issues and the challenges of global food security. An analysis of the scientific literature provides information on possible changes in European cropping systems under climate change. Their effects on the use/resource balances of agricultural products in each of the world's regions are simulated to 2050 using the GlobAgri balance model, developed as part of the Agrimonde-Terra foresight project (Inra-Cirad).world's regions is simulated until 2050 using the GlobAgri material balance model developed as part of the Agrimonde Terra foresight study (INRA-Cirad).

Summary Report, Condensed Report, Extended Report

2019 - 4Carbon storage in French soils. What is the potential in terms of the 4 by 1000 objective, and at what cost?

Advanced study commissioned by the French Environment and Energy Management Agency (Ademe) and the French Ministry of Agriculture.

The "4 ‰ soil for food security and climate" initiative aims to increase the carbon stock in all the world's soils by one four-thousandth each year in order to offset anthropogenic CO_2 emissions. The study aims to assess the potential for additional carbon storage in French agricultural and forest soils, with reference to this 4‰ objective. It is based on a review of scientific knowledge on the subject, and on an estimate, through simulations across the whole territory, of the effects of a range of land uses and agricultural practices aimed at increasing soil carbon content without increasing direct and indirect GHG emissions. These results, together with an estimate of the cost to the farmer of implementing these different practices, make it possible to assess the technical and economic potential of storage on a regional and national scale.

Summary Report, Condensed Report, Extended Report

2017 - Assessment of ecosystem services provided by agricultural ecosystems

Advanced study conducted as part of the EFESE program run by the French Ministry of the Environment, and the Inra-EcoServ metaprogram

The EFESE (French Evaluation of Ecosystems and Ecosystem Services) project aims to develop tools for evaluating and mapping ecosystem services (ES), so that they can be integrated into the development of national and local public policies. The aim of the study is to propose an analytical framework adapted to agricultural ecosystems: clarification of concepts, inventory and classification of ES rendered to farmers and society, description of the mechanisms and determinants of ES, definition of criteria and methodologies (indicators, data) for biophysical evaluation and mapping, avenues for economic evaluation... It also presents the first results of the implementation of this analytical framework on a set of 18 services.

Summary Report, Condensed Report, Extended Report)

2017 - What role can French forests and forest-based industries play in mitigating climate change?

Advanced study commissioned by the French Ministry of Agriculture, in partnership with IGN

The forestry sector is considered strategic for limiting climate change, thanks to its capacity to store carbon in ecosystems and wood products, and to the substitution effects of fossil fuels or competing materials that emit higher levels of GHG. The aim of the study is to assess the GHG emission mitigation potential of the French forestry-wood sector up to 2050. It includes an analysis of the academic literature, as well as a comparison of the effects of three contrasting forest management scenarios, based on numerical simulations. This part of the study uses three models to simulate, respectively, the growth of forest stands, the impact of changes in climatic conditions on this development, and the economic effects of the behavior of agents in the sector.

Summary Report, Extended Report

2017 - Land use change and environmental assessment

Advanced study commissioned by the French Environment and Energy Management Agency (Ademe) and the French Ministry of Agriculture

The aim of this advanced study is to carry out an inventory and critical review of the available scientific literature on the effects of different reorientations (agricultural, forestry, food, energy, land use) on land use change and the induced environmental impacts (on climate, soil, water...). In order to synthesize the information, the scientific corpus gathered was subjected to three analyses: a global textual analysis to identify and map the documented land use changes and impacts, a systematic review on the sub-corpus of reorientations towards non-food uses of biomass, and a meta-analysis on the only articles quantifying greenhouse gas emissions linked to bioenergy production.

Summary Report, Condensed Report

2017 - ScénEnvi: Visions of the future and the environment Major categories of scenarios resulting from an analysis of international foresight studies relating to the environment

Advanced study commissioned by the Alliance nationale de recherche pour l'environnement (AllEnvi), carried out by AllEnvi's Transversal Foresight Group, with the involvement of DEPE (project management and coordination).

In order to contribute to scientific programming in the environmental sciences, a study of major future visions of the state of the environment was undertaken. More than 300 recent international forecasts (less than 15 years old) for the 2030, 2050 and 2100 horizons were analysed, revealing the predominance of governance and economics in the construction of scenarios. This approach has led to the construction of 11 scenario families grouping together the various trends and factors of change. These families are themselves structured into three groups: decline, no environmental priority and environmental priority. While the first two generate sometimes severe environmental degradation, the third leads to rather encouraging results.

Summary Report, Extended Report

2016 - Reducing food losses and waste in an increasingly urbanised world

DEPE provided methodological support for this advanced study, which was decided on and carried out by Inra's Food-Bioeconomy Scientific Division, with methodological support from DEPE and the involvement of European experts

The aim is to identify and analyse the levers for limiting food waste in urban environments, and promoting the development of "zero waste, zero waste" food systems. The study identifies 9 levers for action (economic, regulatory and technological tools, urban planning rules, training, etc.) to optimize food use, reduce waste and recycle bio-waste. It explores the differentiated implementation of these levers of action in 3 scenarios of urban contexts (metropolization, networks of medium-sized towns, or towns in retreat), and finally points out the need to ensure coherence between actions, notably between measures aimed at reducing loss and waste and product safety requirements.

Summary Report, Extended Report

2015 - North African and Middle East food systems through to 2050: towards a greater dependence on agricultural imports

Advanced study carried out jointly by INRA and the PluriAgri think tank.

The aim is to provide food for thought for public policies and the strategies of private and public operators in this part of the world. The study carries out a retrospective analysis of the region's agricultural and food system (production, consumption and trade), then examines several possible trajectories up to 2050, using a series of simulations that take into account both the expected consequences of climate change and the effects of factors such as technical progress, greater control of irrigation, contrasting changes in diets, as well as differentiated demographic or economic dynamics. This work uses the GlobAgri model of balances between agricultural resources and food uses, created for the Agrimonde-Terra foresight project.

Summary Report, Condensed Report, Extended Report

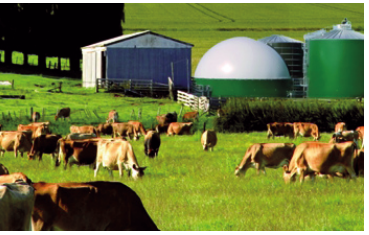
2013 - Crop diversification

Advanced study commissioned by the French Ministries of Agriculture and the Environment

Despite its many agronomic and economic benefits, crop diversification is making little progress in France. The aim of this advanced study is to identify, at farm and industry level, the obstacles to this diversification, and the levers that can be mobilized, by public authorities in particular, to encourage it. The study of a dozen cases of "minor" species (protein peas for animal feed, oilseed flax, hemp, etc.), representative of the diversity of situations, highlights the obstacles at every stage of the value chain: at production level, where genetic selection, crop protection solutions and technical references are insufficient; at market outlet level, where markets are dominated by competition from "major species"; and at coordination level between the economic players in the value chain...

Summary Report, Condensed Report, Extended Report

2013 - Reducing greenhouse gas emissions from the French agricultural sector



Advanced study commissioned by the French Environment and Energy Management Agency (Ademe) and the French Ministry of the Environment.

In France, agriculture accounts for around 20% of total greenhouse gas emissions. The aim of this advanced study is to identify ten technical actions that could improve the GHG balance of agriculture, without any major changes to systems or production levels. The agricultural techniques selected, which concern various sectors, aim to reduce N_2O emissions (by adapting fertilization) or CH_4 emissions (by modifying ruminant feed or manure management), increase carbon storage in soils and biomass (by developing intermediate crops, hedges, agroforestry...), to save fossil fuels... The project assesses their potential for reducing GHG emissions and their cost of implementation by 2030, and carries out a comparative analysis of their efficiency (cost-effectiveness ratio).

Summary Report, Condensed Report, Extended Report

2012 - Reducing nitrate leaching through the use of intermediate crops

Advanced Study commissioned by the French Ministries of the Environment and Agriculture

Most of the nitrate in surface and groundwater is due to excess nitrogen fertilization, as well as natural nitrate production through mineralization of soil organic matter. By introducing a nitrate trapping intermediate crop (CIPAN) between two successive crops, the residual mineral nitrogen in the soil can be captured before it drains from the soil, thus reducing nitrogen leakage; this cover also provides other ecosystem services. To prepare the 5th Nitrates action program (2013), the ministries concerned wanted to have a state of knowledge on this management of intercropping periods. This advanced study analyzes the academic literature, and supplements it with numerical simulations of the development of the cover and its capacity to reduce nitrate leakage, which make it possible to test the effectiveness of CIPAN in various pedoclimatic and agricultural conditions.

Summary Report, Condensed Report, Extended Report

2010 - Écophyto R&D
Ways to reduce the use of pesticides?

Advanced study commissioned by the French Ministries of the Environment and Agriculture

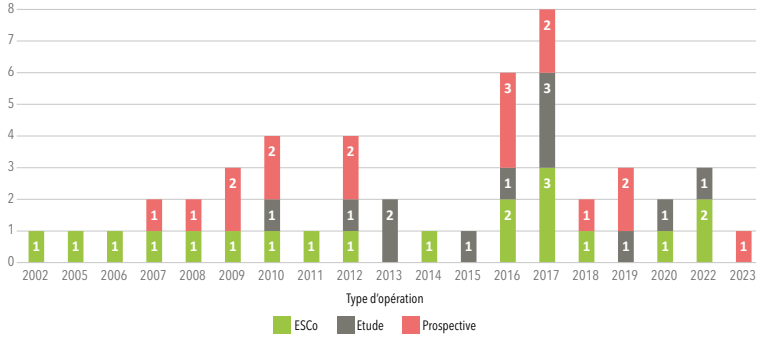
Complementary to the 2005 "Pesticides" CSA, this advanced study mobilizes academic scientific and field experts, notably from the agricultural development sector. The aim is to collectively identify, for France's main crops, pesticide-saving crop management techniques that have been validated in practice. The project takes stock of agronomic options for reducing pesticide use, and estimates the potential impact of their implementation at national level. It also proposes a mechanism for the production, management and dissemination of experimental references on pesticide-efficient cropping systems, for the Ecophyto 2018 program decided following the Grenelle environmental summit.

Summary Report, Condensed Report, Extended Report, Stakeholders' reports

Types of activities conducted

Forty-four projects have been undertaken since 2002, with half of them produced in the last five years: 16 collective scientific assessments, 13 advanced studies and 15 foresight studies. Four projects were conducted as a partnership between INRA and CEMAGREF/IRSTEA.

Number of projects delivered annually since 2002

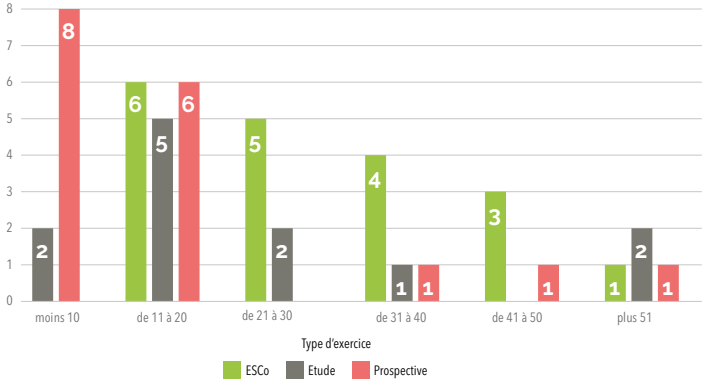


External sponsors include the directorates of the ministries in charge of Agriculture and Food, the Environment, and Health and Territories, as well as national agencies (ADEME, OFB), European agencies (EFSA), technical institutes (ACTA, IFCE, ITAB, ITAVI), agricultural organisations (MSA, Crédit Agricole), and a regional council (Aquitaine). Internal requests (INRA, ALLENVI, AGREENIUM) have mainly involved foresight studies.

Engaging scientific experts

An average of number of scientific experts per project is approximately 20 but with significant variation, from less than 10 to more than 50. The expert groups for foresight studies also include professional experts, who can account for up to 80% of the group.

Number of experts called upon per project



INRAE scientists represent 56% of the experts called upon, with significant variation between projects. At least one foreign expert is involved in more than half of the projects.

Graphic design: © S. Desbourdes - INRAE - 2024
Photos : © INRAE / Ch. Maître - S. Desbourdes - K. Chevet - G. Louviot - C. SLAGMULDER / INRAE / Adobe Stock / L. Wargniez - lucilew.com
April 2024

Centre-siège (headquarters) Paris-Antony
Direction de l'expertise scientifique collective,
de la prospective et des études
147 rue de l'Université – 75338 Paris cedex 07
Tél. +33 1 (0)1 42 75 94 90

Visit us at :

Inrae.fr/collaborer/expertise-appui-aux-politiques-publiques

Institut national de recherche pour l'agriculture, l'alimentation et l'environnement

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

INRAE