AGRICULTURE, FOOD SECURITY AND CLIMATE CHANGE

JOINT PROGRAMMING INITIATIVE

Proposal approved by the GPC, 3 December, 2009

- **Current members (May, 2010)**
  - Austria
  - Czech Republic
  - Cyprus
  - Denmark
  - Estonia
  - Finland
  - France
  - Germany
  - Hungary
  - Ireland
  - Israel
  - Italy
  - The Netherlands
  - Norway
  - Romania
  - Slovakia
  - Spain
  - Sweden
  - Turkey
  - UK

This proposal is a framework to discuss with the members states who want to participate in a joint programming initiative in the area of agriculture addressing climate change and food security research questions. It encompasses earlier proposals from France, UK, Germany Italy and Spain, and combines suggested activities on agriculture and food security, and agriculture and climate change, following discussions at the European Agricultural Research Initiative (EURAGRI) in Madrid 27-30 September 2009. It also takes into account the draft SCAR position paper on Joint Programming (June 2009).

1. Theme and area of the Joint Programming Initiative (JPI)

European and global challenge

- For many key parameters, the climate system is already moving beyond the patterns of natural variability within which our society and economy have developed and thrived. There is a significant risk that many of the trends will accelerate, leading to extreme climatic events and to an increasing risk of abrupt or irreversible climatic shifts (IPCC, 2007, IARU congress, 2009).

- Agriculture and forestry are highly exposed to climate change since they directly depend on climatic conditions. The variability of crop yields has already increased as a consequence of extreme climatic events, such as the summer heat of 2003 and the spring drought of 2007 in Europe. During the summer of 2003, temperatures were up to 6°C above long-term means, and precipitation deficits up to 300 mm. Crop yields were reduced by 20-36 % in regions affected, leading to uninsured economic losses for the agriculture sector in the European Union which were estimated at 36 billion Euros (IPCC, 2007).

- Global demand for food is expected to increase by 50% by 2030 and to double by 2050, due to population growth, urbanisation and increasing affluence in parts of the developing world (FAO, 2008). The world's population is projected to increase from 6 billion to 9 billion by 2050. Food supply must increase sustainably to meet this demand, and is made more complicated by climate change. (UK Royal Society 2009 "Reaping the Benefits – Science and the sustainable intensification of global agriculture".)

- Global climate change can be expected to threaten food production and its supply, for example through changing patterns of rainfall, increasing incidence of extreme weather and changing distribution of diseases and their vectors. Global stocks of some staple foods have declined, and spikes in food prices (such as those seen during 2008) may become more frequent if rising demand cannot be consistently matched by supply.

- The agricultural sector of tropical and sub-tropical countries, particularly in Sub-Saharan Africa, is extremely fragile and vulnerable to climate change. Any major food crisis in these regions will directly and indirectly impact on Europe and it is therefore in its interest to work with these regions on preventive and adaptive measures. In fact, current trends towards relative social and political stability in parts of SSA, representing joint economic opportunities for Europe, could be reversed by negative

impacts of climate change on agriculture. This threat will be amplified by increasing competition between food and (bio)energy production objectives if no innovative and coherent solutions are found.

- By the late 21st century, plant species are projected to have shifted several hundred kilometres to the north and 60 % of mountain plant species may face extinction. A combination of the rate of climate change, habitat fragmentation and other obstacles is projected to lead to a large decline in European biodiversity.

- We need sustained growth in the agricultural sector (crops, livestock, fisheries, forests, biomass, and commodities)[1]:
    - to feed the world
    - to enhance rural livelihoods
    - to stimulate economic growth
    - to maintain and restore ecosystem functions / services

- This proposal therefore focuses on the activities for joint action to address the combined challenges of food security against the continuous threat brought by various scenarios of climate change:

    - we need to act now to secure safe, nutritious and affordable food for the future
    - we need to mobilise funding and coordination across the EU agri-food research sector now in order to have the science and skilled scientists to underpin sustainable food production for the future
    - it takes 10 years to get plant science from lab bench to crop in field
    - this is a preventable crisis – and research is going to be crucial in providing the answers
    - EU research has a key role to play – drawing on world leading expertise and facilities in plant, animal and microbial sciences.

- Long term use of land as a resource for human life does not seem possible without the preservation of ecosystem functions and services. Furthermore they are essential when it comes to resilience and adaptability to climate change and other phenomena of future global change.

- The Millenium Ecosystem Assessment[2] has shown that many ecosystem services are decreasing worldwide, mainly as a result of non-sustainable forms of land use. This is not least due to the fact that many mechanisms involved in the interference of land use with ecosystem functioning and ecosystem services are still unknown or cannot yet be quantified with sufficient precision. This is of particular importance at the level of regions and landscapes and refers to both the direct and the indirect impacts which are due, for example, to the interference with special components of biodiversity.

- Globally, about 2,150 Pg C are stored in plants and soil. Up to a quarter of this amount could be released in the next century through climate change and land use change, which would in turn again accelerate climate change. At the same time, there is

[1] Bob Watson, Chief Scientific advisor, UK DEFRA, Director of the International Assessment of Agricultural Science and technology for Development (IAASTD).
[2] http://www.millenniumassessment.org/en/index.aspx

regional and sectoral potential for increasing the carbon content of terrestrial ecosystems, even more effectively than in other areas, e.g. oceans. Climate change not least affects the possibilities for land use in various regions of the Earth to a considerable extent, though with clear regional variation.

Policy relevant focus

- Climate change in relation with energy security has been considered by G8 as the most important issue to be tackled in the strategic perspective of ensuring global sustainability, while addressing the economic and financial crisis[3].

- The EU White Paper[4] 'Adapting to climate change' gives an overview on the climate change impacts on agriculture and lays out a European framework for action to improve Europe's resilience to climate change, emphasising the need to integrate adaptation into all key European policies and enhance co-operation at all levels of governance.

- The Commission Staff Working Document "The role of European agriculture in climate change mitigation"[5]

- Climate change and Food Security were identified as interlinked challenges for the future research agricultural agenda by the Standing Committee on Agricultural Research (SCAR[6]). SCAR recognised a significant gap in the coordination of relevant research at European level.

- A recent Commission Communication on European agricultural research elaborates on the needs and directions for EU climate change research and innovation, including those for the agriculture sector.

- In addition, as rural areas are exposed to wider climatic risks and as significant parts of rural Europe are characterised by economic multifunctionality, an integrated understanding of the impacts of climate change on agriculture, forestry, land use and rural economies and societies is important.

- The agriculture, forestry and land use sector can play an important role in mitigating climate change via carbon sequestration in soils, bioenergy production and to a lesser extent by reducing N_2O and CH_4 emissions (IPCC AR4 WG3 2007, UNFCCC 2008). By 2010, emissions from European agriculture would be 16% below their 1990 level, because of recent Common Agricultural Policy reforms, water policies and other factors[7]. However, there are also indirect greenhouse gas emissions involved by agriculture, livestock and forestry both from inputs, transport, land use change and downstream (e.g. food processing) activities. The global livestock generates directly or indirectly 18 % of global greenhouse gas emissions as measured in CO_2 equivalents (Livestock's Long Shadow, LEAD, FAO, 2006).

[3] G8
[4] Commission staff working document accompanying the White Paper "Adapting to climate change: Toward a European framework for action" COM(2009) 147.
[5] SEC (2009) 1093 final from July 23, 2009
[6] SCAR conclusions following the 2nd SCAR-Foresight (2006-2009)
[7] Mariann Fischer Boel, Farming's role in mitigating climate change, Conference on "Adapting to Climate Change – Brussels, 3 July 2007.

- A substantial increase of the European research into climate change impacts and adaptation is one of the recommendations made by the European Economic and Social Committee[8] [9]. *Research has to answer the question how the growing demand for food, bio-energy and bio-fuels can be met simultaneously in a world with shrinking water and land resources, increasing soil degradation and under accelerated global warming all impairing on land productivity.*

- Adaptation measures can be taken at national, regional and local levels. Because adaptation is a trans-boundary issue, countries bordering the EU, as well as key regions outside Europe notably in SSA, will also be considered and adaptation will be integrated in all relevant external policies. The international aspects of adaptation are addressed in the policy paper "Toward a Comprehensive Climate Change Agreement in Copenhagen"[10].

It will be extremely difficult to balance food deficits in one part of the world with food surpluses in another, unless major adaptation investments are made soon to foster the comparative advantage of affected regions in appropriate agricultural sectors. These investments may include trade policy and also the generation of innovative technical and economic opportunities, well beyond conservative measures, such as agricultural breakthrough technologies able to face environmental transformations induced by climate change.
Joint programming on adaptation to and mitigation of climate change in the agriculture, forestry and land use sector will integrate research on climatic trends with extreme events, natural sciences with social sciences, research with actual policy and management, ecosystems with products and services, production with health, food security and food quality issues.

2. Proposing GPC members

Proposal made by: France, United Kingdom, Germany, Italy and Spain.
Proposal supported by: Austria, Denmark, Estonia, Finland, Ireland, The Netherlands and Norway.

Details on estimate of human scientific resources potentially involved and current national programmes are described in Annex 1.

3. Objectives

Much work is already conducted at EU, national and regional level hence a key objective for joint programming is to integrate relevant approaches and create a vision and framework for future activity. This should include issues including:

- The size and dimensions of the problem require a long-lasting and large base research endeavour.

[8] COM (2009) 147 final
[9] C 120/38, Official Journal of the European Union, May, 2008.(on the "Green Paper from the Commission to the Cuncil, the European Parliament, the European Economic and Social Committee of the Regions: Adapting to climate change in Europe – Options for EU action)
[10] http://ec.europa.eu/environment/climat/future_action.htm

- The overarching objective is to integrate adaptation, mitigation and food security in the agriculture, forestry and land use sector.

- Measures providing co-benefits in terms of reducing emissions and increasing resilience of farming, forestry and biodiversity to climate change need to be indentified and promoted.

- Scientific challenge:
  - i) increase the delivery of food security, feed, fiber and other services in an altered and more variable climate
  - ii) contribute to carbon sequestration, fossil fuel energy substitution and mitigation of N_2O and CH_4 emissions.
  - iii) investigate
  - Possibility of reducing greenhouse gas emissions by means of specific cultivation systems and management options
  - Trade-offs between carbon-optimized land management, food production and the preservation of biodiversity and other ecosystem functions and services
  - General socio-economic conditions and consequences of the integration of climate protection goals in land use decisions.
  - The development of robust methods for the qualitative and quantitative analysis and evaluation of ecosystem functions and services and for determining the resilience of the given ecosystems
  - dependence of ecosystem functions and services on biodiversity, climate change and land management
  - Development of socio-economic tools for consideration of ecosystem functioning/services in land management.

- A major knowledge objective concerns the development of a systemic understanding, integrating a large range of disciplines from climatology, to ecology, biology, agronomy, forestry and socio-economy, through plant, soil and animal sciences, that will be strongly connected around a central spine of agro-ecological modelling.

Adapting planning in agriculture cannot only rely on knowledge about global climate patterns, but needs detailed information on regional impacts and meaningful assessment of the adaptive options and their feasibility at local and farm level.

Cost-benefit analysis of short- and long-term adaptation/mitigation strategies will be addressed taking into account uncertainties in the projections of climate change and impacts. International research activities (e.g. Earth System Science Partnership, ESSP) and results such as The Economics of Ecosystems and Biodiversity (TEEB[11]) study as well as existing models for enhancing ecosystem functioning and services will be taken into account.

[11] http://www.teebweb.org/

4. Research questions being addressed

Joint Programming has the potential to induce a quantum leap in defining and delivering European Research to meet the challenges of enhancing both food production and environmental benefits while minimising environmental harm.

There is much potential in integrating on a very large scale two major components:, i) developing and implementing specific solutions at the systems and policy levels, ii) developing highly innovative breakthrough technologies.

4.1 Developing and implementing specific solutions at the systems and policy levels

Research should mainly focus on regions where land use is particularly affected by climate change, either directly or indirectly and/or which are relevant for climate protection from a global perspective.

This research area will principally have applied orientation and should yield workable adaptation options, from the production systems to macro-economics, sectorial, food security and environmental policies.

The success mainly depends on action-based research and thus on the generation of knowledge which can be used directly by people in the regions. Usability requires a transdisciplinary approach and is ultimately decided at the level of decision-makers and stakeholders involved in the research process.

The research area needs to integrate different but related topics in a cross-disciplinary approach - environment/climate, business/technology, society/culture, economics/agronomy. Capacity building as part of the research projects will be crucial for the implementation process

Designing integrated mitigation and adaptation strategies.
Adaptation options should limit negative impacts and take advantage of potential opportunities (e.g., elevated atmospheric CO_2, warmer climate at high latitudes, increased rainfall in areas where this will happen). Moreover, adaptive changes in production systems and the potential for system migration or transformation will be assessed based on cost-benefit approaches taking into account environmental constraints, land and labor requirements, demands for food and non-food products and biodiversity issues. This research will also lead to the design of novel cropping, livestock and forestry systems that are adapted to the unchartered climatic and atmospheric conditions of the end of this century.

Mapping regional vulnerabilities for policy support.
There is currently no understanding of the systemic impacts of climate variability and change on rural landscapes and on regions in Europe, the Mediterranean and other regions that are key to European interests, notably in SSA. Research will address these issues by developing integrated GIS tools providing decision support for local, regional, national and European planning and policies. This approach will help prioritizing regions and systems for the adaptations and mitigation strategies to be applied. Sectoral policies concerning e.g. land use, nature and biodiversity conservation, water and irrigation, greenhouse gas emissions and soil quality (e.g. soil carbon sequestration) will also benefit from this approach.

Environmental impact
Food production and the supply chain can have wide-ranging positive and negative impacts on the environment. Negative impacts include escalating water and land use, soil erosion and degradation through loss of fertility or desertification, loss of biodiversity, and intensive use of energy (for production, notably for fertiliser manufacture, and for supply, especially in transport and refrigeration) with associated greenhouse gas emissions. By contrast, agricultural land can manage water quality and flood risks and act as habitats for wildlife, while agricultural soils are major carbon sinks. Negative environmental impacts will need to be minimised, particularly as the demand for food rises and the climate changes. Research will also lead to the design of novel cropping and livestock systems that are adapted to the uncharted climatic and atmospheric conditions of the end of this century.

Food supply
The food security issue in coordination with the challenges of the changing climate definitely has geo-political connotations. One aspect of this is that trade patterns could be envisaged to be affected. The degree to which and the way it may happen is in itself an important element in the challenge that the JP consortium will have to tackle.

Greenhouse gas emissions

- Can the carbon stocks be increased and the greenhouse gas emissions be reduced by adapting land management practices ? How, to what extent and in which timespan can this be done in particularly relevant regions?
- What impact does climate change itself have on this mitigation potential?
- To what extent does potential GHG optimization of land management compete with other societal demands on land use?

Ecosystem functions / services

- How can data about ecosystem function and services (ESF/ESS) be collected at regional level and how can their responses to climate change be understood?
- What interactions and feedbacks can be found between different ecosystem services and with major land use systems and which services are most affected by climate change?
- Which monetary and non-monetary assessment methods are suited for the quantification of ESF/ESS so that their use in market mechanisms is possible?
- What socio-economic conditions must be fulfilled and/or what mechanisms/tools must be available to enable ESF/ESS to be considered in future land use decisions?

Pests and diseases
They present further challenges to the production and supply of food – from crops and from farmed animals and aquaculture. Threats include new and emerging pests and diseases, and the spread of existing ones to new regions because of climate change. Increased use of chemical inputs to address these problems will be limited by regulatory requirements, the need to avoid potential adverse environmental impacts, and the greater costs of producing fertilisers and pesticides because of rising energy prices. Exploitation of natural resistance to pests and diseases, and tolerance of environmental stresses, will be important for sustainably increasing yields or for expanding the area that can be used for agricultural production under adverse or variable conditions.

Water conservation in agriculture
Water will need to be increasingly saved and used more efficiently, taking advantage in some regions of the increased precipitations in winter.
Methods for combining water and soil conservation techniques in agricultural systems, (e.g. through reduced crop evapotranspiration by regulated deficit irrigation techniques), optimizing on-farm irrigation performance, reducing energy consumption in pumping stations at irrigated areas and minimizing pollutants in irrigation return flows will be studied.

- **Efficiency of resource use:** while land and water in particular will become increasingly scarce, it will also be important to improve the efficiency with which other resources are utilised, including nitrogen and phosphate fertilizers, energy and other inputs to agriculture and all stages of the food supply chain.

- **Reducing waste** is a major challenge: at the same time as enhancing yields and improving efficiency, there is a pressing need to find new ways of reducing waste throughout the food supply chain. Post-harvest losses are estimated to be currently 40% worldwide, with waste occurring in storage, during transportation and processing, from the retail sector and by consumers.

4.2 Developing highly innovative breakthrough technologies.

The shared vision developed through joint programming will include work on a roadmap of research and related activities which need to be delivered at EU level by participants to realise the challenges identified. Topics for consideration in such a roadmap include breakthrough technologies which will be identified by participants but might include:

Crop production Research will be needed on crops for the EU and other temperate regions and also for the developing world. Research targets include:

a. **Identifying key drivers of yield productivity and stability** to enhance crop productivity; **developing crop plants** with optimised efficiency of resource use (water, nitrogen, other nutrients) while maintaining quality; reducing reliance on fertilisers whose production is heavily dependent on fossil fuels; making more efficient use of chemical inputs through precision application and controlled release.

b. Major scientific challenges such as raising photosynthetic efficiency through engineering C_3 and C_4 metabolisms to take advantage of elevated atmospheric CO_2, improving nitrogen fixation in legumes and enhancing N transfers to cereals or other non-legume crops.
c. **preventing yield losses due to diseases and pests by developing resistant crop plants**; implementing research on weed control. Advances will require improved knowledge of the biology and genetics of the host and pathogen or pest and (importantly) their interactions under climate change.
d. Research to sustain effective use of herbicides, insecticides, and fungicides in the face of evolution towards resistance.

e. Enhancing tolerance of abiotic stresses (e.g., drought, salinity, flooding, ozone, UV, high and low extremes of temperature, especially at critical stages such as flowering); research is needed especially on the effects of combinations of such stresses.
f. Reducing post-harvest losses from pests and diseases.
g. Preserving the nutritional quality of crops, which will be affected by elevated CO2 and climate change, improving their composition in major storage compounds and their characteristics for the production of nutritionally enhanced food, by applying existing and new technologies, including biotechnologies.
h. Exploiting the potential of genomics (of model plants, crops, microbes, pathogens, pests, beneficial organisms) – the pace is accelerating with advances in sequencing technologies.
i. Mathematical and computational approaches – leading to improved ability to predict outcomes and provide tools for decision-making in managing agricultural systems using an integrated network of excellence centres for scenario model data integration and large scale observation and modelling infrastructures.
j. Making best use of genetic diversity: to develop new cultivars of current crops and to explore the potential of new crops for adapting to the predicted climate, including rising carbon dioxide and temperature.
k. Making more effective the transfer of knowledge from advances gained using model species into practical application in crops.
l. Soil science/microbiology and root-soil interactions, including how to improve nutrient flows to support plant growth; also root diseases.

Livestock production There are arguments on health and environmental grounds to reduce overall meat consumption in the western diet, but global demand for meat and dairy products is predicted to increase greatly. Research targets include:

a. Identifying possible changes in processes that would help to reduce adverse impacts on the environment especially to greenhouse gas (methane, nitrous oxide) emissions from livestock and manures – using nutritional and genetic approaches to improve efficiency of production (conversion of plant biomass to meat) and to reduce resource inputs and waste.
b. Managing the threat from and impact of animal diseases, including both current and newly emerging or exotic diseases, and spread of disease from and to wild animals. Risks from animal diseases are increasing with climate change and increased movement of animals and people. Effective surveillance, monitoring, prevention and treatment are all required.
c. New zoonotic diseases are a particular threat, and EU-wide and global approaches to horizon scanning for potential new diseases are needed.
d. Detection and treatment of sub-clinical diseases that can have major impact on productivity and welfare.
e. Integrated approaches to reducing disease through genetic selection for immunity combined with vaccine development (where there may be opportunities for international sharing of effort), epidemiology and improved knowledge of host-pathogen interactions.
f. Mathematical modelling will be important to enable prediction of disease outbreaks and to optimise interventions.

g. Ensuring animal welfare under future climates (e.g., increasingly variable and extreme weather) and/or altered production methods: research needs include developing objective measures of well-being in animals.
h. Animal breeding for improved yield and quality while maintaining appropriate welfare.

This research targets can be rooted on:

- Adaptation and mitigation 'omics'. The recent advances in 'omics' research, inter-specific hybridization, molecular marker-assisted breeding, transgenics, functional (agro) ecology and crop physiology to design and develop new genotypes for crop, tree and adaptations, morphology, phenology and yield traits.
- Mitigation technologies taking into account possible trade-offs and synergies with adaptation, biodiversity, soil and water resources.
- Adaptation biotechnologies. For example, Genomics based biotechnologies will help accelerating crop improvement for adaptation to changing climatic and hydrological environments.

5. Added-value, benefits and impact

Joint Programming in this field is based on the conviction that sharing the burden in research to cope effectively and efficiently with the challenges presented would bring benefits to all involved in such an exercise. This was a major message from the SCAR Foresight Working Groups and a recent Commission Communication on agricultural research. Bringing together the key research organisations and funders in Europe could enable a great leap forward in developing the concept of multifunctional and sustainable food production for different agro-ecological zones and regions within Europe and within other regions that are key to European interests, notably in Africa.

- In the context of the Common Agricultural Policy reform, agro-ecological measures will be of increasing economic importance. Agriculture, forestry and agri-business competitiveness will increasingly depend on the compatibility of this sectoral policy with climate change. The research undertaken will have a major role in avoiding food crises in the developing world, thereby reducing regional conflicts, refugees and migrations. It will also have human health impacts by improving the monitoring and understanding of zoonotic animal diseases.
- Most initiatives have been taken at national level to date, but a joint EU approach and research programming can maximise the effectiveness of national efforts, particularly in: i) sectors that are closely integrated at EU level such as agriculture, ii) cross-boundary issues such as river basins and biodiversity management, iii) disadvantaged regions and regions most affected by climate change. These measures must be supported and strengthened by an integrated and coordinated approach at EU level. Therefore a Joint Programme should not ignore the diversity of European cropping, livestock, forestry, fisheries and integrated farming systems priorities: 'Joint' does not mean homogeneous, but coordinated.

- The EU is well placed to facilitate coordination and the exchange of best practice between Member States on agricultural production. The necessary adaptations/corrections in the Agricultural Knowledge System and governance systems have to cope with faster change in the future. Thus the systems of knowledge generation need to reform with quite some speed.
- The combined challenges of global food security and climate change put a renewed emphasis on the need for continuous agricultural research, at EU and national levels, for example on development of crops, varieties and herds better adapted to future conditions, and supported by continued research with specific objectives for different regions and different production systems. Joint Programming provides an opportunity to review the balance among thematic priorities.
- A joint programming initiative in this area will send a strong signal of support to international programs such as the "Climate Change, Agriculture and Food Security Challenge Program" (Climate Change Challenge Program, CCCP) which unites the complementary strengths of the CGIAR system and the Earth System Science Partnership (ESSP), and their respective partners, to address the most pressing and complex challenge to food security in the 21st century. This international program is a response to accumulating evidence that the food security and livelihoods of hundreds of millions of people who depend on small-scale agriculture are under significant threat from climate change. The goal of the CCCP is to overcome the additional threats posed by a changing climate on attaining food security, enhancing livelihoods and improving environmental management.
- Solutions cannot be adopted through the EU Framework Programme because in this context we are addressing a long-lasting, large-base research endeavour, greatly affected by site specificity that characterizes agroecosystems and their management practices. National Programmes provide a convenient site for this research, although joint programming is required to magnify the results and avoid current duplications. In the international arena these issues have been addressed at regional scale by countries like the USA and Australia, through agencies such as the USDA ARS and the CSIRO.

6. PRELIMINARY SUGGESTIONS CONCERNING THE GOVERNANCE AND IMPLEMENTATION OF JPI

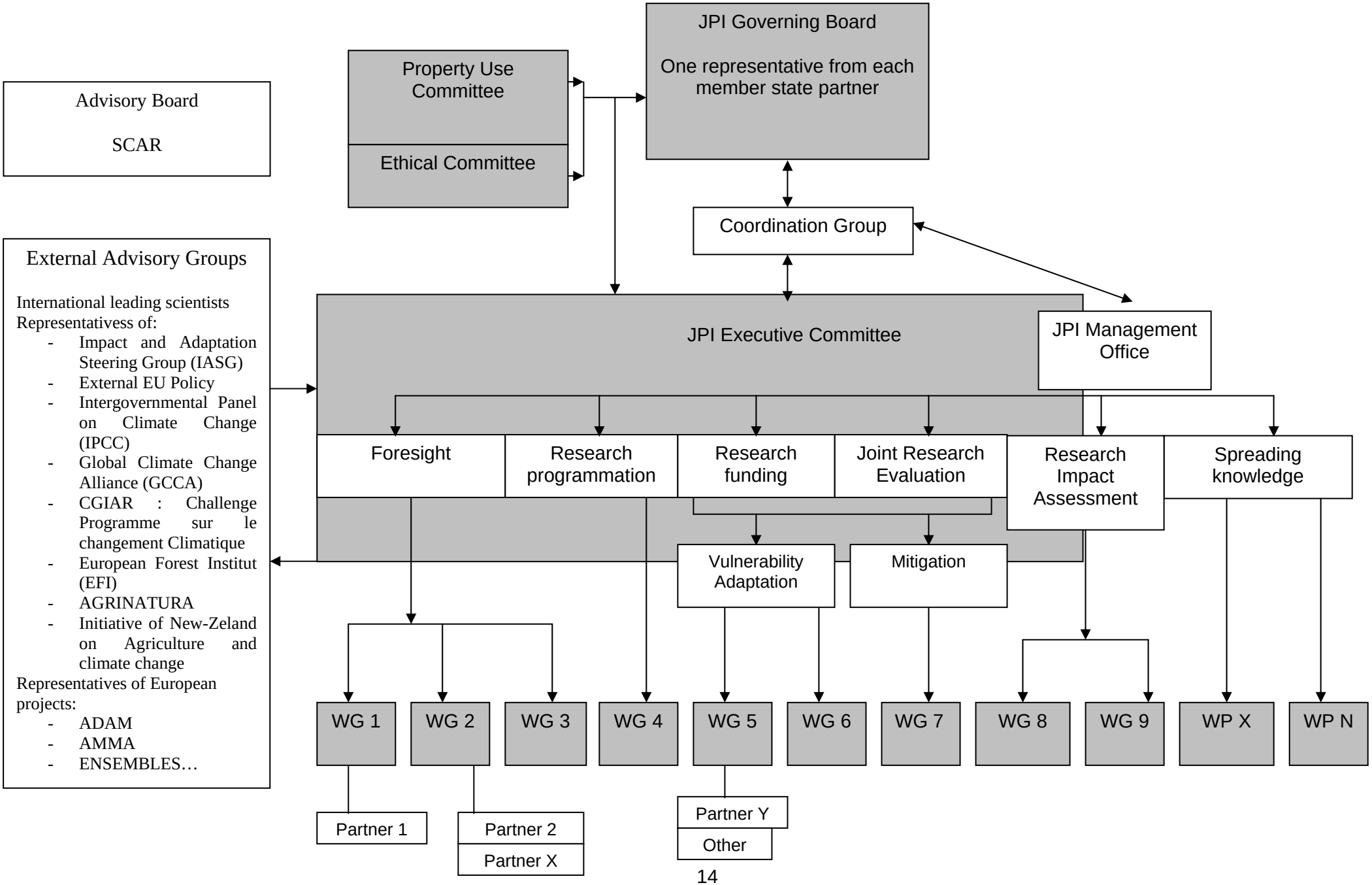
Governing Board (GB) – comprising one senior representative of each Member State contractor, the GB will be responsible for the political and strategic orientation of the initiative. Meets at least once per year, chaired by the coordinator.

Executive Committee (ExC) – in charge of operational and day-to-day management of the initiative, made up of leaders of each work package activity, chaired by the coordinator. Meets at least twice per year.

Coordination Group will be responsible for delivering tasks and will act on behalf of all countries. The Coordination Group will lead a **JPI Management Office** where a project manager and administration will be based.

Advisory Board can deal with foresights, identifying challenges …

External Advisory Groups


Advisory Board
SCAR
Property Use Committee
Ethical Committee
JPI Governing Board
One representative from each member state partner
Coordination Group
External Advisory Groups
International leading scientists
Representativess of:
- Impact and Adaptation Steering Group (IASG)
- External EU Policy
- Intergovernmental Panel on Climate Change (IPCC)
- Global Climate Change Alliance (GCCA)
- CGIAR : Challenge Programme sur le changement Climatique
- European Forest Institut (EFI)
- AGRINATURA
- Initiative of New-Zeland on Agriculture and climate change
Representatives of European projects:
- ADAM
- AMMA
- ENSEMBLES…
JPI Executive Committee
JPI Management Office
Foresight
Research programmation
Research funding
Joint Research Evaluation
Research Impact Assessment
Spreading knowledge
Vulnerability Adaptation
Mitigation
WG 1
WG 2
WG 3
WG 4
WG 5
WG 6
WG 7
WG 8
WG 9
WP X
WP N
Partner 1
Partner 2
Partner X
Partner Y
Other

ANNEX 1

The envisaged involvement of participating countries and research performing organisations potentially involved

- On the basis of information received, the number of high level staff potentially involved is at least 2300 scientists.

- The main international partnerships are:
  - USA, Canada, China, India, Brazil, Australia, New-Zealand and African and Asian countries.
  - Impact and Adaptation Steering Group (IASG), External EU Policy, Intergovernemental Panel on Climate Change (IPCC), Global Climate Change Alliance (GCCA), CGIAR : Challenge Programme on climate change, European Forest Institut (EFI), AGRINATURA, Initiative of New-Zealand on agriculture and climate change.

- Each country has many national programmes (or similar ways of organisation and funding) in this area. Some national programmes are quoted in this document. Hereby there are some examples :

  - *For UK*
    In the UK much work has been conducted on identifying challenges and the role of research in meeting these challenges (DEFRA – UK food security assessment 2009; DEFRA – development of indicators for sustainable food system 2009; BBSRC - road map for future research for a secure and sustainable food supply, 2009; Royal Society - "Reaping the Benefits – Science and the sustainable intensification of global agriculture", 2009). The BBSRC Roadmap is being developed into plans for a substantive UK programme on food security, which includes possible Joint Programming at EU level.

  - *For France*
    ANR funds research in this area via different programmes as genomics, food and industrial processes, biodiversity and bioressources and agricultural systems, territories, sustainable agriculture and climate change. These national incentive budgets also support the EraNets calls in this area. For 2009, the budget devoted to was around 60 millions € in which 30 millions € at least can be attributed to the "Agriculture, food security and climate change" thematic.
    ANR funded a foresight on adaptation to climate change of agriculture and managed ecosystems (ADAGE). For the next 3 years, the main priority for ANR is "Agriculture, food security and climate change".

  - *For Ireland*
    DAFF funds research in this area via the Research Stimulus Fund which is run as a public good competitive programme with the objective of contributing significantly at farm level.
    The 2005 and 2006 RSF Calls contributed €5.8 to agri-environment / agri-energy research (climate change). In 2007, a total funding commitment of in €9.7m was allowed for the lifetime of the projects.

Supported projects 05-Present	Institutions	Senior Researchers	Monetary Commitment 05-Present
27	8	22	€15.5m

- *For Denmark*

  The Danish Government has introduced a new comprehensive initiative in 2009, "Green Growth". This initiative includes a green research and innovation plan with the aim to develop new environmentally friendly and energy effective technologies. The focus will be on investments in research and development in order to contribute to (green) growth and welfare. The initiative includes research and development in relation to agriculture, food production and environment/climate and will involve both the public and private sector. One of the most important means to strengthen effects of this research initiative/scheme will be by taking part in the international research co-operation and co-ordination activities.

  Denmark has also introduced a Green Development and Demonstration Programme. This programme will focus on the protection of climate and on environment, nature, food security, health, and animal welfare. This research programme will also enable co-ordination with international research programmes in the food, agriculture and fisheries areas.

- *For Norway*
  - The Food research programme (Matprogrammet).
    The annual budget is approx. 15 mill EUR.
  - The Research Programme on Nature-based Industry (Natur og Næring).
    The annual budget is approx. 11 mill EUR.
  - Climate change and impacts in Norway (NORKLIMA)
    The annual budget is approx. 10 mill EUR.
  - Norway-global patner (NORGLOBAL)
    NORGLOBAL shall strengthen Norwegian research on and with the South. It includes Povpeace, Cgiar, Women- and gender research, Globalisation of the environment and Climate research.The annual budget is approx. 10 mill EUR.
  - Norwegian environmental research towards 2015 (MILJO2015)
    The programme is designed to generate new, research-based knowledge to promote the sustainable use and management of the natural and cultural environments. The annual budget is approx. 8,3 mill EUR.

1) From Denmark

	Aarhus University – Faculty of Agricultural Sciences
Sub-areas	
Impacts, Adaptation and mitigation strategies	• Experimental and modelling studies of climate change impacts on water, soils and crops with respect to crop production, crop quality and environmental impacts • Experimental and model-based analyses of adaptation measures and field and landscape scales to improved crop production while maintaining low environmental impacts • Climate change impacts on weeds, pests and diseases and development of crop protection strategies under climate change • Improvement of water efficient management and irrigation systems for adaptation to drier and more extreme climatic conditions • Genetic adaptation of crops to more extreme climatic conditions and for more efficient and low emission crop production • Experimental analysis and modelling of soil processes affection soil carbon storage affected by environmental and management conditions in agriculture • Monitoring and modelling of soil carbon stocks at site, landscape, regional and national scales • Livestock breeding for low GHG emissions • Development of livestock production and feeding systems for low GHG emissions • Development of new low-emitting manure handling systems, including separation, acidification and biogas • Modelling of greenhouse gas emissions at field and farm scales • Experiments and modelling of greenhouse gas impacts of bioenergy cropping systems • LCA of food production chains with emphasis on the agricultural production
High level Staff (Nb)	100 scientists with relevant expertise
European and global projects	Numerous EU (e.g., NitroEurope, SAFIR, AG2020, Legume Futures), Nordic and national projects (Danish Research Councils (for both independent and strategic research); International Centre for Research in Organic Food Systems). Large-scale experimental biogas facility. Technology platforms for "-omics". Monitoring systems for greenhouse gases from soil, crops and livestock.
Infrastructures	Plot, farm and landscape scale modelling platforms. Long term agroecological experiments for studying C and N cycling and climate change impacts on these systems. Long-term stations for environmental monitoring (soil, climate, water).
Partners	Many European countries (e.g. CEH (UK), INRA(FR), IMK-ZK (DE), SLU (SE), MTT (FI), UMB (NO), BOKU (AU), WUR (NL), UNIFI (IT)), Japan (NARO), China (CAU), US (e.g. UCLA), Brazil (EMBRAPA)

	Risø DTU
Sub-areas	
Adaptation and mitigation strategies	- Genetic adaptation to abiotic (GHG and temp) and biotic stress (fungal diseases) in European crops and wild plants; selection in advanced climate phytotrons over multiple generations - Adaptation contra acclimatization in crops; genome scans and expression-arrays. - Modelling of biodiversity impacts - LCA analysis of impacts to crop production chain - Monitoring GHG exchange in forestry and agro-ecosystems. - GWP assessments in agro-energy systems. - Soil C-sequestration assessments and monitoring (black C)
High level Staff (Nb)	20 scientists with relevant expertise
European and global projects	Numerous EU (CLIMOOR, VULCAN, INCREASE), Nordic and national projects (Danish Research Council; International Centre for Research in Organic Food Systems).
Infrastructures	FACE and advanced climate phytotron (our contribution to EU infrastructure project INCREASE). Genotyping and phenotyping facilities, array-profiling, field trails. Long-term platforms for Cand N cycling in forestry and seminatural systems.
Partners	Many European countries (e.g. CEH (UK), INRA(FR), IBIMET (IT), IMK-ZK (DE); BfW (DE); IVL (SE), SLU (DE), US Forest Service(US))

	LIFE – Copenhagen University	
Sub-areas		Relevant disciplines
Impacts, Adaptation and Mitigation strategies	• Models of impacts on agriculture • Climate variability and tipping points • Genetic adaptation to thermal stresses & drought • Tropical agriculture • Emergent pests & diseases • Food-feed-fuel cropping systems • Food systems • Ecosystem services • Tropical agro-forestry and carbon sequestration • Multi-scale modelling of complex systems, including multi-agent systems • Economics • Impact analyses, RCM	Agronomy Ecology Forestry Environment Ecophysiology Agroclimatology Genetics Pathology Epidemiology Soil sciences Animal sciences Plant sciences Farming systems Lifecycle analysis Economy Social sciences Modelling Computing

	and seasonal forecasting • Education – internet courses	
High level Staff (Nb)	120 scientists with relevant experience and H indices over 20.	
European and global projects		
Infrastructures	• Genotyping and phenotyping platforms, several modelling platforms, • Long-term experiments and research platforms • Education – PhD, MSc and BSc courses. • Internet courses on environment and climate change	
Partners	• International Alliance of Research Unis (held the March 2009 climate conference in Copenhagen) • Enviro Unis (WUR, SLU. Hohenheim) • LIFE – Secretariat for the Challenge (ESSP/CGIAR) Programme on Climate, Agriculture and Food Security.	

2) From The Netherlands

	Wageningen UR
Sub-areas	
Adaptation and mitigation strategies	• Environment Science & Policy, sustainable development, poverty releave • Plant, Animal & Social. Sciences • Climate Change • Water Resources • Soil sciences • Ecosystem services • Terrestrial &Aquatic Sciences • Agriculture, Forestry, Land use and Bioenergy & biorenewables • Competing claims and food supply security • Scenario Development & Policy analysis • Observation/monitoring experimental • Communication, Dissemination Stakeholder and participating approaches • System Analysis
High level Staff (Nb)	65 senior scientists
European and global projects	National projects (Knowledge for Climate, Climate Change and Spatial planning, Knowledgebase Ministry Agriculture and food security) International projects (FP6 & -7, e.g. CarboEurope, NitroEurope, ADAM, HighNoon and EU SSA e.g. PICCMAT, CLIMSOIL)
Infrastructures	Laboratories, field trials and sites, monitoring capacity, desk research, process and policy support tools and tool boxes
Partners	All European countries and major research institutes and universities, PEER network Environment, participation in many COST actions, MoU's with numerous renown international research institutes, participation in UN e.g. IPCC fora and Assessment Report. teams, participation in National and International programming committees in other EU countries and continents.

3) From United Kingdom (Scotland)

	Biotechnology and Biological Sciences Research Council (BBSRC)
Sub-areas	
Adaptation and mitigation strategies	• Agriculture • Crop Systems • Crop genetic improvement • Soil science • Ecosystem function • Bioenergy • Climate Change mitigation • Livestock Systems • Systems modelling • Agronomy • Crop disease pathology and disease diagnostics • Livestock genetics • Microbial biology and genetics • Animal behaviour and welfare • Animal disease epidemiology • Farm animal immunology • Avian immunology • Food borne zoonoses • Biodiversity • Arbovirology • Land management • Food safety • Food manufacturing • Diet and health • Bioinformatics • Genome sequencing • Knowledge transfer
High level Staff (Nb)	As of 1 April 2009, 1,811 staff employed on indefinite contracts at BBSRC, of which 758 in science category.
European and global projects	Numerous national, European and global networks, projects and world reference laboratories.
Infrastructures	North Wyke Research Platform, Rothamsted Research, Institute for Animal Health, Institute for Food Research, The Genome Analysis Centre, systems biology centres, Research Farms, experimental facilities, data collection and handling, data management systems, sewage sludge plots, insect survey, biosecurity facilities (ACDP 2, ACDP 3, SAPO 4), genome sequencing, virus collections, parasite collections, gnotobiotic animals, disease-free animals, inbred chicken lines, insectaries – UK, EU and global level.
Partners	UK, Europe, USA, Canada, China, India, New Zealand, South America, Japan

	Scottish Agricultural College
Sub-areas	
Adaptation and mitigation strategies	• Agriculture • Crop Systems • Soil science • GHG emissions • Crop genetics • Livestock Systems • Systems modelling • Agronomy • Crop disease pathology and disease diagnostics • Livestock genetics • Animal behaviour and welfare • Disease epidemiology • Ecology • Agricultural Economics • Resource Economics • Social sciences • Knowledge transfer
High level Staff (Nb)	>30 staff with relevant expertise covering subject areas above
European and global projects	Numerous national and European projects on GHG emissions and climate change funded by UK Government departments Defra and RERAD as well as through the European Framework programme from FP6 and FP7. Eg Greengrass, NitroEurope, CarboEurope, Co-ordination of Legume-Futures
Infrastructures	Farm-based resources for large scale and long-term applied research studies. Environmental monitoring Genetic evaluations for crops and livestock Soil science
Partners	Research institutions in most EU countries. Various institutions in N America (eg Virginia Tech), S America (eg Brazil), Australasia (eg AgResearch (NZ)) Africa (Malawi, Zimbabwe) Wide spread of commercial companies

4) From Austria

	BFW
Sub-areas	
Adaptation and mitigation strategies	Forestry Ecology Environment Monitoring Soil sciences Vegetation sciences Forest Pathology Biology Biodiversity Biofuels Carbon sequestration Nitrogen mitigation Microbiology Genetics Natural Hazards Risk management Landscape analysis GIS applications Modelling Computing
High level Staff (Nb)	110 senior scientists with relevant expertise
European and global projects	Numerous national projects (funded by Ministries, Federal Estates, Austrian Science Fund, Technology funds, Climate funds, Forestry Sector, Industrial Companies.. etc) Coordination, Steering Committee, Partner in numerous EC projects (FP5 and 6) Nofretete, Sustman, NitroEurope, Climmani, Sustman, Envasso, Cost 856, 627, 639, E27, ES804, Greenhouse Gas Europe..etc.
Infrastructures	long-term experiments and research platforms, environmental monitoring (soil, plant, air, climate, water, biodiversity, avelanges, landslides) forest inventory soil inventory national soil database plant, soil, microbe, pest & genetic laboratories
Partners	All European countries (e.g. UK, Finland, Germany, Spain, NL, Sweden, Denmark, Poland, Hungary, Czech Republic, Romania, Slovenia, Bulgaria, Croatia...) World wide cooperations (China, Zimbabwe, USSR, USA, Canada, Australia…)

5) From Italy

	Center of Bioclimatology (Department of Agronomy and Land Management) – University of Florence
Sub-areas	
Adaptation and mitigation strategies	Agroclimatology Agrometeorology Agronomy Bioclimatology Biometeorology Computer science Ecology Ecophysiology Environment Epidemiology Farming systems Life cycle analysis Modelling Renewable energy
High level Staff (Nb)	8 senior scientists and 10 junior scientists with relevant experience in the field of climate change impact and adaptation. Technicians expert in meteorological monitoring and data analysis. Several undergraduated and graduated students (PhD, Master, etc.)
European and global projects	Activity is supported by national and international projects provided by the local administrations, governmental institutions, European Commission, World Meteorological Organization, Ministry of Education and Research, private companies and farms (CLIVARA, SLAM, COST 711, COST 718, COST 734, ICONE, PRADA, HIALINE
Infrastructures	Experimental farm, agrometeorological stations, meteorological data-bases, ecophysiological sensors and instruments, modelling platform, computer centre
Partners	Partners are represented by the main research centers at National and International level. Collaborations are established with international bodies, such as FAO, WMO, ESF, JRC.

6) From Germany

	Leibniz Association (Network "Leibniz AgriResearch plus")
Sub-areas	
Adaptation and mitigation strategies	• Agriculture, Forestry, Aquaculture and Bioenergy • Plant physiology • Grenetics of biotic and abiotic stresses • Crop genomics • High throughput phenotyping platforms • Animal physiology • Animal genetics and genomics • Social Sciences • Climate change and GHG modelling • Water Resources • Soil Sciences • Landscape science and rural development • Farming system science • Pest management • Ecosystem services • Microbial engineering • Impact Assessment • Scenario development and Sustainability assessment • Science-policy dialogue • Agro-ecosystem modelling • Observation/monitoring experimental • Communication, Dissemination Stakeholder and participating approaches • Agricultural economics • Supply chain analysis • Rural development and land tenure • Institutional economics • Policy analysis and advisory • Coupled human-environment systems • Assessment of ecosystem services and biodiversity • Spatial statistics and pattern recognition • Agent based modelling, fuzzy logic modelling, economic modelling and simulation • Participatory impact assessment
High level Staff (Nb)	>70 staff with relevant expertise covering subject areas above (Cluster of eight research organisations around knowledge based bio-economy)
European and global projects	National projects (Climate Change adaptation, Spatial planning, Carbon dynamcis, genomics of biotic & abiotic stresses, functional genomics, Leibniz Excellence Project: China International Research Group) International projects (FP6 & -7, e.g. SENSOR, NitroEurope, CLARIS; LIAISE; SPARD; CA2AFRICA; SABRE, EADGENE ,COST 634, 734; BioExploit; ERA-PG EXBARDIV, ERA-PG TritNONHOST)

	FP7: Prototypical Policy Impacts on Multifunctional Activities in Rural municipalities (PRIMA); Enlargement Network for Agripolicy Analysis (AgriPolicy), FP6: Structural change in agriculture and rural livelihoods (SCARLED);
Infrastructures	Physiological and biochemical Laboratories, experimental farms, field trials and sites, monitoring capacity, desk research, GIS and modelling; process and policy support tools and tool boxes, long-term experiments and research platforms
Partners	All European countries and major research institutes and universities, European research network landsacape Tomorrow; World wide cooperation (USA, Canada, Brasil, Russia, India, China, South Africa, Tanzania, Argentina; Indonesia, Turkey), Worldbank, FAO

	Helmholtz – Centres
Sub-areas	
Adaptation and mitigation strategies	• methodological platform for observation, integrated analysis and evaluation of terrestrial systems • global change effects on ecosystem C/N stocks and exchange processes between the terrestrial biosphere, the atmosphere and hydrosphere • feedback mechanisms between the biosphere and atmosphere under changing environmental conditions. • impacts of changes in climate, atmospheric deposition of nutrients/pollutants and land use • Landscape Ecology • Ecosystem dynamics • Ecosystem Functions and Services • Biodiversity, Agro-biodiversity • Plant phenotyping, interactions between the genome and the environment, plant performance, novel plant-based substances and materials • Agriculture, sustainable food production • Biofuels, sustainable biomass production • Soil Science, Soil Ecology, soil functions and material fluxes, transport in soils and aquifers • Microbiology, microbial-plant interactions, modelling of soil-plant systems, terrestrial ecogenetics, genetic resources • Ecology and Health; interactions between abiotic and biotic components in environmental ecosystems and their influence on the quality of the most important components of human diet: plants and water. • Water resource management • economically optimized cultivation strategies under hydrological constraints • impact of irrigation strategies on water balance. • Ground water systems, natural purifying capacities / potential • Fate of chemicals and antibiotics in the environment (water & soil) • Remediation strategies, Environmental engineering, Eco-Technology • Nature protection • Innovative measuring and monitoring concepts, long-term observation

	sites, methodological issues of up-scaling at long-term observation sites such as TERENO • Remote sensing • integrated modelling approaches • regional climate modelling • Land-use conflicts • Vulnerability assessment • drivers of regional change processes in rural-urban regions originating from climate change, land use change and demographic trends • impact of land use and management changes on water and matter balance and habitats • assessment of historic, current and future land use changes and its socio-environmental impacts • stakeholder involvement, decision making, decision support systems
High level Staff (Nb)	>80 ; HGF Research Program Earth & Environment: Terrestrial Systems; 5 HGF centers with relevant research activities on agriculture, food security and Climate Change, comprising at least 8 Institutes
European and global projects	National HGF Programme Earth & Environment, Sub-programmes Atmosphere & Climate and Terrestrial Systems http://www.helmholtz.de/en/research/earth_and_environment HGF-Project: TERENO GLOWA Elbe (BMBF), DIVA (BMBF) Numerous national projects funded by DFG EU Projects, e.g. Nitro-EUROPE IP, CARBOEUROPE-IP, NEWATER IP, AMMA, ALARM, SENSOR.... COST ES0804: Advancing the integrated monitoring of trace gas exchange between biosphere and atmosphere COST ES0806 SIBAE Stable Isotopes in Biospheric-Atmospheric-Earth System Research COST 859: Phytotechnologies to promote sustainable land use management and improve food chain safety COST 869: Mitigation Options for Nutrient Reduction in Surface Water and Groundwaters
Infrastructures	Laboratories, Field stations, long-term observation sites, computing facilities (GIS, modelling, climate modelling etc.), remote sensing facilities, data storage,
Partners	All European countries and major research institutes and universities worldwide PEER - Partnership for European Environmental Research Brazil, Israel, China, Canada, Africa

7) From France

	Institut national de la recherche agronomique (INRA), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD)
Sub-areas	
Adaptation and mitigation strategies	• Agronomy • Ecology • Forestry • Environment • Ecophysiology • Agroclimatology • Genetics • Pathology • Epidemiology • Soil sciences • Animal sciences • Plant sciences • Farming systems • Lifecycle analysis • Economy • Social sciences • Modelling • Computing • Genomics including tropical crops • Tropical agro-forestry and carbon sequestration
High level Staff (Nb)	180 senior scientists with relevant expertise
European and global projects	Numerous national projects (funded by ANR, French national research agency; Ministries in charge of agriculture and environment), coordination of EC projects (FP6 and FP7; e.g.) and European initiatives Contribution to the CGIAR Generation Challenge Programme and to the formulation of the Climate Change Challenge Programme and to European initiatives
Infrastructures	Genotyping & phenotyping platforms, several modelling platforms, staff embedded in CGIAR & NARS in the sub/tropics, long-term experiments and research platforms (ORE), environmental monitoring (soil, climate, water, biodiversity)… European infrastructures : ANAEE, ICOS, IMECC …
Partners	All European countries (e.g. WUR, BBSRC, Leibniz institutes, TEAGASC…) Brasil, China, … Australia, New-Zealand, USA, Canada, … Mega worldwide disposal (DOM, Southern countries)

8) From Ireland

	Teagasc
Sub-areas	
Adaptation and mitigation strategies	• Environment Programme – Water, Air, Soil & Biodiversity • Animal & Crop Sciences • Land Use and Bioenergy & biorenewables • Economic Scenario Development & Policy analysis • Quantification/ Verfication, observation, monitoring experimental • Communication, Dissemination Stakeholder and participating approaches • System Analysis & LCA
High level Staff (Nb)	12 senior scientists
European and global projects	National projects (15 research GHG projects and nine crop bio-energy projects). Three International projects (FP7, e.g. GHG Europe, Nitro Europe, Legumes in Futures)
Infrastructures	Laboratories, field trials and sites, monitoring capacity, desk studies, internal working groups preparing policy and technical publications.
Partners	National – National University of Irealnd, Dublin, Cork, Galway, Maynooth; Trinity College Dublin; Waterford Institute of Technology; Depatment of Agriculture, Food & Fishereis; Department of Environment, Heritage & Local Government; Environment Protection Agency; Climate Change Research Panel Wageningen UR, Cranfield, Aberdeen, Cambridge; INRA; EPH Zurick, Max Planck Institute. MoU's with numerous renown international research institutes (more general than specifically GHG e.g. Dairy NZ; University of Davis;) Participation in UN -. Expert Panel for the Mitigation of Agricultural Nitrogen Connection with NZ (Lincoln University, Ag Research, Learn Network)

9) From Spain

	INIA (Institute for Agricultural Researching and food), Ministry of Science and Innovation
Sub-areas	
Adaptation and mitigation strategies	• Agriculture • Forestry • Observation / monitoring experimental • System analysis • Long term experiment and research platforms • Carbon sequestration • Plant breeding • Modelling • Computing • Landscape analysis • Epidemiology • Agronomy • Water use in agriculture and forestry. • Natural resources economy
High level Staff (Nb)	36 scientists with relevant expertise (total 188 scientists) in INIA. Additionally, INIA funding reaches a community of about 400 researchers and research trainees on the topics related to this JPI
European and global projects	INIA manages the research programme on Oriented Agro-forestry research of the National Research Plan (NRP) of the Ministry of Science and Innovation. This programme funds researchers from INIA, from the Agro-forestry RTD Institutes of the Regional Governments, and occasionally from other research Institutes and Universities. In addition to this research funding activities, researchers from INIA currently execute 36 projects, funded by the INIA programme, other programmes of the NRP and the Framework Programme of the European Commission.
Infrastructures	Forest inventory, soil inventory, national soil database, plant, soil, microbe, pest & genetics laboratories, experimental farms, agrometeorological stations, meteorological databases, ecophysiological sensors and instruments, modelling platforms, computer centre.
Partners	Many European Countries, in addition to spanish universities and other Research institutions.

	Non Oriented Fundamental Research Programme of the National Research Plan (NOFRP-NRP), Ministry of Science and Innovation
Sub-areas	
Adaptation and mitigation strategies	• Agriculture • Forestry • Observation / monitoring experimental • System analysis • Long term experiment and research platforms

	• Carbon sequestration • Plant breeding • Modelling • Computing • Landscape analysis • Epidemiology • Agronomy • Water use in agriculture an forestry • Natural resources economy
High level Staff (Nb)	The NOFRP-NRP does not perform research activities, but performs research funding activities reaching out to a large community of researchers in different fields related to agriculture and forestry. It is estimated that about half of the 1,100 researchers and research trainees that receive funding from this programme are directly concerned by the research objectives of the JPI. This estimate leads to a figure of about 400 potential researchers and research trainees. This programme funds researchers from CSIC, Universities, the Agro-forestry RTD Institutes of the Regional Governments and INIA.
European and global projects	The NOFRP-NRP currently funds 360 multi annual research projects, with a typical duration of three years. Again, approximately half of them are directly related to the objectives of this JPI, leading to about 180 projects. In addition to research projects financed by the NOFRP-NRP, researchers take part in projects financed by other institutions, including the Framework Programme of the European Commission.
Infrastructures	The concerned research groups have access to research infrastructures related to their field of expertise. The NRP also funds scientific infrastructures via research projects (small size) and specific calls (large, multi user infrastructures).
Partners	Many European Countries, in addition to cooperation betwee the different Research institutions in cooperative research projects.

	Agro-foresty RTD institutions of the Regional Governments (comunidades Autónomas), AFRTD-RG
Sub-areas	
Adaptation and mitigation strategies	• Agriculture • Forestry • Observation / monitoring experimental • System analysis • Long term experiment and research platforms • Carbon sequestration • Plant breeding • Modelling • Computing • Landscape analysis • Epidemiology • Agronomy • Water use in agriculture an forestry

	• Natural resources economy
High level Staff (Nb)	The different AFRTD-RG do not perform research activities, but perform research funding activities reaching out to a large community of researchers in different fields related to agriculture and forestry. Each AFRTD-RG agency funds RTD proposals in their geographic domain (some exceptions to this rule apply), following specific calls for proposals. This programme funds researchers from CSIC, Universities, the Agro-forestry RTD Institutes of the Regional Governments and INIA. Some 300 researchers and research trainees could be currently involved in these RTD projects.
European and global projects	The AFRTD-RG institutes fund research activities that researchers usually perform in addition to their participation in INIA or NOFRP-NRP projects. These researchers also take part in projects financed by other institutions, including the Framework Programme of the European Commission.
Infrastructures	The concerned research groups have access to research infrastructures related to their field of expertise. The AFRTD-RG can fund scientific infrastructures using a variety of research funding instruments, specific to each region.
Partners	Many European Countries, in addition to cooperation betwee the different Research institutions in cooperative research projects.

10) From Finland

	Relevant Research Institutes, Universities and National Programmes in Finland
	Research institutes and universities: Agrifood Research Finland (MTT) www.mtt.fi Finnish Meteorological Institute (FMI) www.fmi.fi Finnish Environment Institute (SYKE) www.ymparisto.fi Finnish Forest Research Institute (METLA) www.metla.fi Game and Fisheries Research (RKTL) www.rktl.fi Finnish Food Safety Authority (EVIRA) www.evira.fi European Forest Institute (EFI) www.efi.int Several universities: Universities of Helsinki, Joensuu, Jyväskylä, Kuopio, Oulu, Tampere, Turku etc. **National Programmes:** the National FICCA Research Programme on Climate Change (FICCA) (link) Climate Change Adaptation Research Programme (ISTO) (link) Mitigation of Climate Change (ClimBus) (link) **Centers of Excellence:** CoE in Physics, Chemistry, Biology and Meteorology of Atmospheric Composition and Climate Change CoE in White Biotechnology – Green Chemistry Research CoE in Plant Signal Research
Adaptation and mitigation strategies	several areas
High level Staff (Nb)	TBA (MTT: 50 scientists)
European and global projects	Nordic Excellence in Research Initiative (link) ERA-NET CIRCLE numerous others
Infrastructures	ICOS, EUSAAR, IMECC , SMEAR
Partners	Research institutions and universities in most EU countries.

11) From Estonia

Institutions	**Estonian University of Life Sciences,** **University of Tartu,** **Tallinn Technical University,** **Agricultural Research Centre,** **Estonian Research Institute of Agriculture** **Jõgeva Plant Breeding Institute**
Sub-areas	
Impacts, adaptation and mitigation strategies	- Monitoring GHG emissions in forestry and agro-ecosystems. - Plant production, plant breeding - Animal husbandry, animal breeding - Agrometeorology - Soil Sciences - Crop and animal diseases - Forestry - Water resources - Renewable energy - Food sciences and biotechnology - Molecular Biology, Cell Biology, Genetics - Environmental sciences (environmental protection) - Rural economy
High level Staff	40-50 scientists with relevant expertise
European and global projects	Numerous national and international projects
Infrastructures	Genotyping and phenotyping facilities, field trials, laboratories, experimental farm, gene banks, meteorological database, physiological and biochemical laboratories, national soil database, etc.
Partners	Numerous European countries

12) From Norway

	UMB (Norw. Univ of life sciences)
Sub-areas	- Animal and Aquacultural Sciences - Chemistry, Biotechnology and Food Science, - Ecology and Natural Resource Management, - Economics and Resource Management, - Plant and Environmental Sciences, - International Environment and Development Studies,
Adaptation and mitigation strategies	- Fertilizer use and production systems. - Animal lifestock and breeding - Genetic adaptation to abiotic (GHG and temp) and biotic stress - Adaptation and acclimatization in crops - Total food chain aspects - LCA analysis of impacts to crop production chain - Monitoring GHG exchange in agro-ecosystems. - Soil C-storage and sequestration.
High level Staff (Nb)	Approx. 50 scientists with relevant expertise
European and global projects	In FP7: Quantomics, FlexWood.
Infrastructures	Parter in The Centre for experimental animal research (SHF), Partner in The Centre for plant research in controlled climate (SKP), SNP-analysis, Proteomics platform.
Partners	

	Bioforsk (Norw. Inst. for agricultural and environmental res.)
Sub-areas	- Plant Health and Plant Protection - Soil and Environment - Arable Crops Arable Crops - Horticulture and Urban Greening - Grassland and Landscape - Organic Food and Farming - Arctic Agriculture and Land Use
Adaptation and mitigation strategies	- Fertilizer use and production systems. - Genetic adaptation to abiotic (GHG and temp) and biotic stress - Adaptation contra acclimatization in crops - Modelling of biodiversity impacts - LCA analysis of impacts to crop production chain - Monitoring GHG exchange in agro-ecosystems. - Soil C-storage and sequestration.
High level Staff (Nb)	Approx. 50 scientists with relevant expertise
European and global projects	In FP7: Genesis, Phytomilk, IPOPY, REFRESH, AWARE Also collaborative projecys in Africa, Asia and the Barents region.
Infrastructures	Partner in The Centre for plant research in controlled climate (SKP), several field experimental stations.
Partners	

	NOFIMA (The Norw. Inst. of Food, Fisheries and Aquaculture Research)
Sub-areas	- Consumer, food and context, - Food safety and quality, - Innovation and product development, - Sensory science
Adaptation and mitigation strategies	- Total food chain aspects - Consumer preferences
High level Staff (Nb)	Approx. 50 scientists with relevant expertise
European and global projects	In FP7: FORBIOPLAST, NAFISPACK, BrightAnimal.
Infrastructures	Fish breeding stations, experimental food processing and kitchen.
Partners	

	CIENS (Oslo Centre for Interdisciplinary Environmental and Social Research)
Sub-areas	- CICERO (Center for International Climate and Environmental Research) - met.no (Norwegian Meteorological Institute) - NIBR (Norwegian Institute for Urban and Regional Research) - NILU (Norwegian Institute for Air Research) - NINA (Norwegian Institute for Nature Research) - NIVA (Norwegian Institute for Water Research) - TØI (Norwegian Centre for Transport Research) - UiO (University of Oslo, Department of Geosciences)
Adaptation and mitigation strategies	- Mitigation and costs - Specific impacts of climate change for various regions - Vulnerability to climate change for different countries or regions - To incorporate local knowledge in adaptation strategy - Climate change related pressure on natural ecosystems and resources - Management of natural resources including biodiversity, fish and wildlife - Water management
High level Staff (Nb)	Approx. 100 scientists with relevant expertise.
European and global projects	Large participation in a broad range of FP7-projects. Also many collaborative projects in Africa, Asia and Latin-America.
Infrastructures	
Partners	

	Skog og landskap (Norw. Forest and landscape inst.)
Sub-areas (relevant for this JPI)	- Forest health (pathology and entomology) - Landscape planning and management - Forest and soil monitoring
Adaptation and mitigation strategies	- Fertilizer use and production systems. - Adaptation and acclimatization in tree species. - Agricultural and forest soil C-storage (monitoring).
High level Staff (Nb)	Approx. 10 scientists with relevant expertise
European and global projects	In FP7: BioBio
Infrastructures	Partner in The Centre for plant research in controlled climate (SKP), Tree breeding experimental field station.
Partners	

	NVH/VI **(Norw. School of Veterinary Science/National Veterinary inst.)**
Sub-areas	- Production animals - Animal heath - Food safety
Adaptation and mitigation strategies	- Animal lifestock, health and breeding - Total food chain and safety aspects
High level Staff (Nb)	Approx. 20 scientists with relevant expertise
European and global projects	In FP7: Veg-i-trade.
Infrastructures	Parter in The Centre for experimental animal research (SHF), Veterinary hospitals
Partners	

	NILF (Norwegian Agricultural Economics Research Institute)
Sub-areas	- Economic matters pertaining to Norwegian agriculture. - International matters concering Norwegian agriculture (EES, EU, WTO, etc.). - Rural devlopment, including rural tourism and "niche productions". - Environmental matters relating to agriculture. - Food consumption, self-sufficiency and readiness for self-supply. - Accounting and taxation matters.
Adaptation and mitigation strategies	- Research for the policies related to food security, pricing and sustainable production.

High level Staff (Nb)	Approx. 10 scientists with relevant expertise
European and global projects	
Infrastructures	
Partners	