



Agriculture,
Food Security
and Climate Change



FACCE – JPI

First Biennial Implementation Plan

2014 – 2015

www.faccejpi.com

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List of acronyms and abbreviations

CSA	Coordination and Support Action
CGIAR	Consulting Group on International Agricultural Research
EC	European Commission
EIP	European Innovation Partnership
ESFRI	European Strategy Forum on Research Infrastructures
GB	Governing Board
GHG	Greenhouse gas
GRA	Global Research Alliance
H2020	Horizon 2020
JPI	Joint Programming Initiative
KIC	Knowledge and Innovation Community
PPP	Public Private Partnership
SAB	Scientific Advisory Board
StAB	Stakeholder Advisory Board
SCAR	Standing Committee on Agricultural Research
CWG	SCAR Collaborative Working Group
SRA	Strategic Research Agenda
IPWG	Working Group on Implementation
WP2	Work Package 2 of the CSA

1 • Introduction

The Joint Programming Initiative Agriculture, Food Security and Climate Change (FACCE – JPI) was one of the three new JPIs launched by the European Council in October 2010. Today, FACCE – JPI brings together 21 countries that are committed to build an integrated European Research Area addressing the challenges at the crossroads of agriculture, food security and climate change.

In December 2012, the FACCE – JPI Governing Board (GB) launched the FACCE – JPI Strategic Research Agenda (SRA) ¹. This document describes the scope of the JPI, its five core research themes, and suggestions for short-, medium- and long-term actions.

The five core themes are:

CT1 • Sustainable food security under climate change, based on an integrated food systems perspective modelling, benchmarking and policy research perspective.

CT2 • Environmentally sustainable growth and intensification of agricultural systems under current and future climate and resource availability.

CT3 • Assessing and reducing trade-offs between food production, biodiversity and ecosystem services.

CT4 • Adaptation to climate change throughout the whole food chain, including market repercussions.

CT5 • Greenhouse gas mitigation: N₂O and CH₄ mitigation in the agriculture and forestry sector, carbon sequestration, fossil fuel substitution and mitigating GHG emissions induced by indirect land use change.

To go beyond the five different actions currently underway (see below) and subsequent to the release of the SRA, it was decided by the FACCE – JPI to elaborate an Implementation Plan to cover the period of 2014 – 2015. This implementation plan has the aim to describe the joint actions that the FACCE- JPI GB aims to undertake in this period, based on the short and medium-term priorities of the FACCE – JPI SRA.

This first biennial Implementation Plan lays out the actions to be launched by the JPI in the coming 2 years with an equilibrated approach between alignment, exploring new research areas through workshops and new funding. It marks the beginning of a process which will be repeated every 2 years in order to be synchronised with the timing of the European Commission's Strategic Programmes and Work Programmes for H2020.

Following the JPI conference held in Dublin on February 28 – March 1, 2013, FACCE – JPI strongly welcomes the emphasis given to JPIs as actors in H2020 and in the building of the European Research Area. We are pleased that the European Commission intends to support JPIs in aligning national research programmes and in the implementation of their Strategic Research Agendas (SRA) as highlighted by Commissioner Geoghegan-Quinn. Building on the strong and fruitful relationship with the European Commission, we intend to continue this positive interaction in a partnership with the EC on common priorities in the area of Agriculture, Food Security and Climate Change for Horizon 2020 and also to initiate a dialogue across all pillars of H2020 and also within the EIP on Agricultural Productivity and Sustainability and the Bioeconomy strategy ². With H2020 we see opportunities to create new fruitful ways of working together in partnership. With this in mind, a number of topics are proposed to the EC, including a Coordination and Support Action, to allow the JPI to accelerate its progress toward achieving its goals, as described below.

¹ The FACCE- JPI Strategic Research Agenda is available at: <http://www.facejpi.com/FACCE-JPI-Home/FACCE-JPI-News/SRA-press-release>

² See: Innovating for Sustainable Growth: A Bioeconomy for Europe: http://ec.europa.eu/research/bioeconomy/pdf/201202_

2• Methodology

Work in the FACCE – JPI led to the identification of three categories of actions for research in the SRA.

1• ALIGNING

It was recognised that in some areas, research is being carried out and funded by national programmes, but this work is not coordinated at the EU level. Other areas of research are concentrated in a given geographical region. In other research areas, a given thematic is well covered in some, but not all countries. These areas are considered as research subjects that could benefit from **alignment** of national strategies and programming between the Member States. In some cases, where there is research that is more advanced, the area will be further explored for its market potential.

2• EXPLORING

A second category concerns emerging research areas, for which **exploratory workshops or ideas laboratories** could be organised by FACCE – JPI and financed through FACCE – JPI participants.

3• INVESTING

This third category concerns areas where there is need for greater efforts across Europe. These areas concern research appropriate for **new funding**, for example through transnational calls or through Horizon 2020, in the form of collaborative research projects, new ERA-NETs (which in fact are a mix of national funding and European Commission top-up), or Research Infrastructures (e.g. ESFRI).

On the basis of these 3 categories, the Secretariat prepared a matrix crossing these categories with the 5 core research themes. A consultation was then carried out, seeking input from the GB as well as the Scientific Advisory Board (SAB) and the Stakeholder Advisory Board (StAB) (Figure 1). Moreover, given the importance of the Implementation Plan to the future of FACCE – JPI, the GB decided to put in place a Working Group on Implementation (IPWG). This IPWG met twice, once in April 2013 to review topics for new funding to send to the European Commission, and again in May 2013 to discuss categories for alignment and emerging areas. Following the first meeting, topics for new funding were sent to the European Commission for consideration in the first work programme of Horizon 2020 as requested by the EC following the Dublin conference. These different inputs allowed the Secretariat to revise the matrix and to prepare the Implementation Plan. This Plan was sent to the GB, SAB and StAB for further feedback and then a revised draft Implementation Plan was prepared.

Many topics, in all three categories, were proposed, reinforcing the clear need for further research to meet the challenges that FACCE sets out to tackle. However, seeing as it is not possible to undertake all these actions over the two year period of this Implementation Plan, a process of prioritisation was undertaken during a Broad – Based Concluding Meeting, held on June 24, 2013. This event concluded a series of mapping meetings, organised on each of the core themes in the frame of WP2 of FACCE-JPI: “*Mapping and foresight for strategic collaboration*!”. The topics presented here are those that were considered as the highest priorities by the FACCE – JPI members. Also, it was concluded that joint programmes can be developed around clusters that integrate identified priorities. These clusters are:

1• Land and water management (including soil systems) for climate adaptation and mitigation

This cluster links CT4 and CT5, with relevance to CT3.

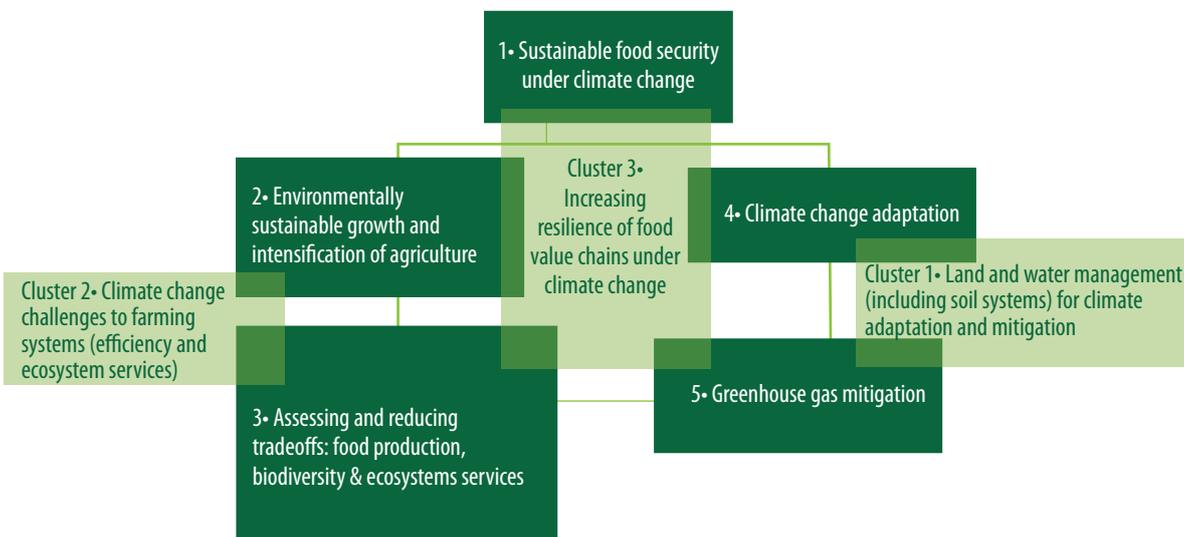
2• Climate change challenges to farming systems (efficiency and ecosystem services)

This cluster brings together CT2 and CT3, and includes: a) the multiple functions required of land under climate change and b) increasing the efficiency of agriculture supply chains under climate change. This cluster is production-oriented.

3• Increasing resilience of food value chains under climate change

CT1 is the core of what FACCE-JPI is trying to achieve, with resilience embedded in each of the CTs. This cluster therefore interfaces with all CTs and is presented as consumer/demand-oriented.

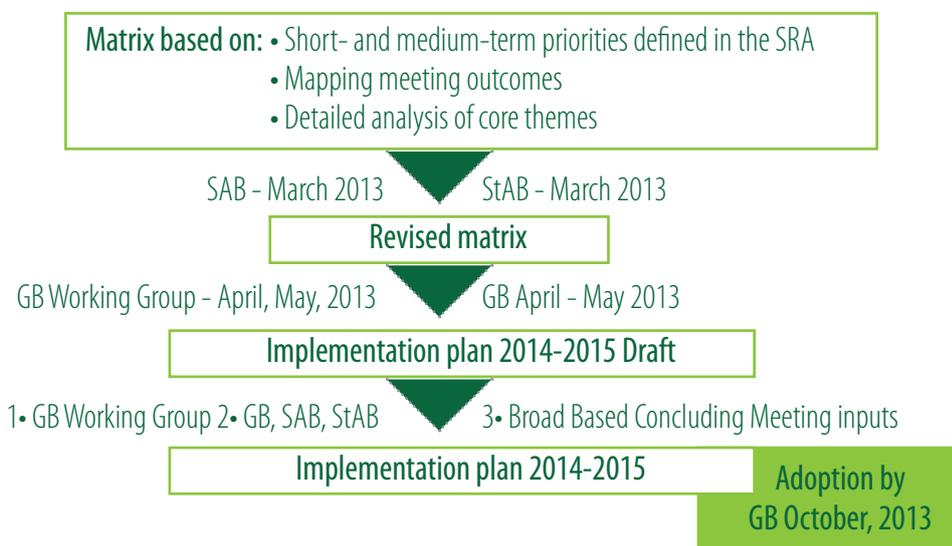
Figure 1 • Transthematic clusters



Such an integrative approach will facilitate a broad policy support and use of different lines of action to tackle the challenges.

This meeting also considered some of the cross-cutting issues to be addressed when designing research actions (Annex). To put in place new actions, the GB may establish a working group, including representatives of the SAB and StAB, to define the scope of the action and the means for carrying it out.

Figure 2 • Method for establishing a FACCE-JPI Implementation Plan



3• Instruments

Implementation of the SRA will require the development of multiple simultaneous actions covering the three categories described above: the alignment of existing national strategies and programmes, exploring emerging areas, and investing in areas for which there is need for greater efforts across Europe: i.e. **new funding**, either through Horizon 2020 (collaborative projects or ERA-NETs) or through joint calls that FACCE – JPI countries decide to finance completely themselves.

A. Instruments for aligning

Alignment of national programmes is the core activity of FACCE – JPI. The FACCE-JPI mission is to achieve, support and promote integration, alignment and joint implementation of national resources under a common SRA to address the diverse challenges in agriculture, food security and climate change. Given the immensity of the societal challenge being addressed, no one can be expected to meet the challenge alone.

By aligning national programming, FACCE – JPI seeks to progress faster towards solutions to solve societal challenges and to avoid duplication, to better cover research gaps, to create critical mass and European added value and to use limited resources more efficiently.

Knowledge Hub

In order to align national research programming, new ways of working together are required. FACCE – JPI has already conceived a novel and innovative instrument, the “Knowledge Hub”, for its pilot call. A Knowledge Hub associates 3 complementary dimensions: Research, Networking and Capacity Building. A Knowledge Hub functions through a two-step process in which researchers submit a Letter of Intent (LoI) to their national funder who then decides eligibility on a competitive or non-competitive basis, according to the countries’ own rules. Eligible groups are then invited to submit a full proposal as one single consortium, which is then reviewed by an international evaluation committee. Countries may choose to fund new research or to participate only through the funding of coordination costs which cover networking, additional costs for coordinating and costs for running common activities initiated by the Knowledge Hub. Knowledge Hubs are particularly well suited to research areas with a relatively restricted research community. Other novel tools are being considered for development as described below.

MACSUR, the first FACCE – JPI Knowledge Hub

MACSUR gathers the excellence of existing research in livestock, crop, and trade science to describe how climate variability and change will affect regional farming systems and food production in Europe in the near and the more distant future and the associated risks and opportunities for European food security. The project was launched in June 2012 for a period of three years. This action brings together 76 research groups from 18 countries and aims to improve the characterisation of European food security due to climate change and to enhance adaptation capacity through improvements in modelling of impacts of climate change on agriculture. This ambitious project has estimated total costs of around 15 million €.

Knowledge Network

Another proposed instrument, similar to a Knowledge Hub, is the “Knowledge Network”. In this case, a larger research community is involved and thus a number of consortia are chosen in a competitive process (in contrast to only one in a Knowledge Hub).

Thematic Annual Programming (TAP)

Means for aligning in the most cost and time-efficient way are being considered for development that do not involve classic “calls”. In this case, based on the SRA, mapping meetings, bibliometrics and advanced poster analysis, topics would be defined which are shared across many countries. Then national programme managers would be invited to meet with each other along with the SAB and the StAB to define topics to be shared by any new national programme in this area. An item text (e.g. one page) will be included in each national programme participating on a voluntary basis. Then, after launching national programmes, a meeting would be organised with all projects working on a given item to discuss objectives, methods and expected outcomes. As part of this coordination, it might be possible to organise a data base from project outputs (to be agreed and planned in advance, funded by the JPI). Following a pilot action of this type, programme managers would be invited to evaluate the effectiveness of this approach.

New ERA-NETs

ERA-NETs are a means of implementing the FACCE – JPI SRA through the aligning of national research programmes via transnational calls. Research projects in ERA-NETs are financed by participating Member States³. In addition to working with the large number of thematically related existing ERA-NETs (around 15 at the beginning of H2020), FACCE – JPI proposes here 2 new ERA-NETs to the EC for its first work programme of H2020.

FACCE ERA-NET Plus

FACCE has successfully applied for an ERA-NET Plus in the 2013 call of FP7. This ERA-NET Plus is on Climate Smart Agriculture: adaptation of agricultural systems in Europe. This ERA-NET will launch a call for proposals in October 2013 with top-up funding from the European Commission. Eighteen FACCE – JPI countries are participating. The indicative total available budget amounts to 20 M € (national public funding + EC top-up funding of 4 M€).

Interaction with existing European and international initiatives

In the matrix below, links to specific existing actions are mentioned as appropriate. In a more general manner, the FACCE – JPI intends to interact with relevant European initiatives, such as Knowledge and Innovation Communities (KICs), other Joint Programming Initiatives (JPIs), Public Private Partnerships (PPPs), European Innovation Partnerships (EIPs), existing ERA-NETs and infrastructures, as well as with international initiatives, such as the Global Research Alliance (GRA), the Wheat Initiative, and the CGIAR programme on Climate Change, Agriculture and Food Security (CCAFS), The joint Research Centre of the European Commission (JRC) and the High-Level Panel Experts of the Committee on World Food Security (HLPE-CES). When appropriate and agreed by all partners, calls will be put in place with new funding (see examples in the box below). The aim is to avoid overlaps and duplications and when appropriate to work together to form synergies.

Multi-partner Call on Agricultural Greenhouse Gas Research

This call was conceived in discussion with the Global Research Alliance on Agricultural Greenhouse Gas Research. The aim of the call is to increase research cooperation and investment in mitigation practices and technologies in order to develop more efficient and productive agricultural systems. Eleven JPI countries are participating (BE, CH, CY, DE, ES, FI, FR, IE, IL, IT, RO, UK) + USA, Canada, New Zealand. The budget for this call is ~ 5 Million in cash + in kind contribution.

The call was launched in January 2013 and projects will begin at the end of 2013.

³ See FACCE-JPI position paper <http://www.facejpi.com/Media/Vision-paper-H2020>

⁴ <http://www.facejpi.com/Media/Toolbox>

An inventory of potential instruments (toolbox) for use by FACCE – JPI can be found on the FACCE – JPI website ⁴.

Joint call with Belmont Forum

The call will focus on the two-way interactions between the dynamics of food systems and land use change, and will offer two types of projects, to promote through mobility the building of interdisciplinary communities/networks that effectively engage relevant stakeholder groups, and to build on established networks which are ready to embark on large-scale research projects.

The call has a total of 14 participants, out of which 8 are FACCE members (FR, UK, CY, NL, IE, IL, CH, RO).

The total participation for the 2013 call amounts to € 9.485 million, out of which € 5.25 million is from FACCE participation. The call opened in July 2013 and closed in September. The first projects will be launched in April 2014.

Joint call with BiodivERsA

Following a scoping workshop held in March 2013, FACCE – JPI and the ERA-NET BiodivERsA will launch a joint call in November 2013 on “Promoting synergies and reducing trade-offs between food supply, biodiversity and ecosystem services”.

B• Instruments for exploring emerging subjects

A number of emerging research areas are considered appropriate for exploratory workshops, which could develop into new calls and which will provide input into subsequent Implementation Plans. FACCE – JPI plans to organise a series of expert workshops to further investigate research needs in these areas, financed through the participants of FACCE – JPI.

C• Instruments for investing in research

Areas where there is need for greater efforts across Europe are considered as appropriate for new funding, for example through transnational calls or through Horizon 2020, in the form of collaborative research projects, calls by ERA-NETs (which in H2020 are a mix of national funding and European Commission top-up), or research infrastructures (e.g. ESFRI). In the case of new ERA-NETs, collaborative projects and infrastructures, FACCE – JPI has worked with the EC to identify common interests and has accordingly proposed a number of topics as indicated in the matrix below (category 3).

4• Action Plan 2014 – 2015

Among the priority actions included in this Action Plan, all 5 core themes are addressed with a good balance between alignment, exploring and new funding. Further, the option to cluster topics has been recognised for gaining broad policy support and good opportunities for joint programming (see above).

This action plan includes 1 Coordination and Support Action (CSA) to allow the JPI to accelerate its progress toward achieving its goals, 4 new alignment actions (category 1 actions), 5 exploring workshops for emerging topics (category 2 actions), 2 new ERA-NETs to be proposed to the EC, 7 collaborative projects, and 3 actions promoting infrastructures, all of which are proposed to the EC (category 3 actions).

Table 1. ACTIONS FOR IMPLEMENTATION

Actions to be carried out in 2014 – 2015, based on the SRA and on the outcomes of mapping meetings and with inputs from the GB, the SAB and the StAB

For each topic, the instrument to be used is indicated. Topics in categories 1 and 2 are to be carried out and financed by FACCE – JPI. Topics in category 3 are proposed to the EC for community funding. Topics marked by stars are FACCE – JPI actions that are in planning [*] or on-going [**]. Topics marked by a [+] are on-going non – JPI actions. Numbers do **not** indicate the order of priority.

Category 1 ALIGNING Mature research > Alignment instruments Including areas where research is scattered > Alignment at geographic or thematic level	Category 2 EXPLORING Emerging subjects > Scoping instruments (dialogue with stakeholders, inputs to category 3)	Category 3 INVESTING Need for common European efforts and developing research > Funding instruments (e.g. through collaborative projects, new ERA-NETs or infrastructures)
CSA action in support of the implementation by participating States of a Joint Programming Initiative on Agriculture, Food Security and Climate Change		
Core theme 1 Sustainable food security under climate change		
<p>1.1.1 FACCE Knowledge Hub. Modelling effect of climate change on agriculture (MACSUR) (2011) [**]</p> <p>1.1.2 International call on Food Security and Land Use Change (FACCE – JPI/ Belmont Forum) (2013) [**]</p> <p>1.1.3 Knowledge Hub. Network of experimental climate change studies on crop and grassland systems. This would potentially include all temperature (heat and cold), water (drought and logging) ozone and elevated CO₂ manipulation experiments. The key need is to create a strong and open data base. This network would complement AnaEE (which has a small number of key infrastructures) and MACSUR (which places its main efforts on modelling) and deliver a data base of experimental climate change studies in Europe (in collaboration with existing initiatives)</p>	<p>1.2.1 Methods for better integrating research on food economics (prices, drivers, trade, markets, etc.) and climate change (e.g. food market price volatility and its relation with climate change) (scoping input for 1.3.1)</p> <p>1.2.2 Food safety implications of climate change and climate variability. Climate change leads to new hazards in the entire supply chain, including agriculture. This will require new knowledge to maintain the high standards and safety of European food</p>	<p>ERA-NETS</p> <p>1.3.1 SUSFOOD ERA-NET. Sustainable food production and consumption [+]. Targeted collaboration on the GHG balance of food systems and on post-farm gate mitigation and adaptation</p> <p>1.3.2 New ERA-NET: Increasing the resilience of regional agrifood systems in Europe to climate variability and food price volatility (e.g. regional agricultural systems and their risk patterns, their resilience, including socio-economics, farmers and industry strategies) Link with climate smart ERA-Net. Note that this is an overarching topic which is expected to stimulate the development of integrated approaches</p> <p>COLLABORATIVE PROJECTS</p> <p>1.3.3 Cost effective approaches to reducing food waste and intelligent use of/ Improve sustainable use of by-products (throughout the production chain e.g. post-harvest losses and food exceeding shelf life of products, consumer habits, food safety) in climate smart and sustainable food chains processes (plant and animal-based). Strategies and technologies suitable for a more sustainable production; strategies and technologies to increase shelf life of products, including the development of new processing, preservation and packaging logistic systems; novel approaches for accurate determination of product shelf life; strategies and technologies to reduce spoilage, better use of waste, including at the consumer level. Link with EIP Agricultural Productivity and Sustainability, SUSFOOD, future Food KIC</p> <p>1.3.4 Reducing the protein dependency of European agriculture through increased production of grain and forage legumes in Europe, improved high quality plant based protein sources, increased feed use of food by-products and enhanced transformation for animal and human consumption. Enhancing human consumption of plant proteins will result in a modification of the eating habits of the European citizens that should be emphasized assuming that nutritional requirements will match with lower consumption of animal proteins. The effects on the whole sector, both environmentally (GHG mitigation), socially and economically should be assessed including demands of food industries to develop attractive plant based eating products and the impact on the nutritional status of risk populations (especially aging and sick populations). In addition, increasing sustainable production from European grassland resources may contribute to carbon sequestration while increasing food security. Link with EIP Agricultural Productivity and Sustainability</p>

Category 1 ALIGNING Mature research > Alignment instruments Including areas where research is scattered > Alignment at geographic or thematic level	Category 2 EXPLORING Emerging subjects > Scoping instruments (dialogue with stakeholders, inputs to category 3)	Category 3 INVESTING Need for common European efforts and developing research > Funding instruments (e.g. through collaborative projects, new ERA-NETs or infrastructures)
Core theme 2 Environmentally sustainable growth and intensification of agricultural systems		
<p>2.1.1 Improving agricultural soil quality Thematic Annual Programming Network Developing novel methods to restore organic matter in agricultural soils, reduce erosion, increase soil quality and reduce organic pollutants and heavy metals (e.g. by increasing soil biological activity, through conservation agriculture, crop and grassland rotations, much and composts, buffer strips, phytoremediation, etc.). Collaboration with JRC and with FAO, with SNOWMAN network</p> <p>2.1.2 Knowledge Network: Development of options for sustainable intensification of European crop and livestock systems. Combined development of breeding (and multiplication of locally adapted seeds and breeds), plant/animal health, mixed farming systems, agro-ecological engineering, precision (livestock) farming, ecotechnologies and biotechnologies for increased environmental sustainability, increased feed efficiency, resource efficiency & conservation, productivity and competitiveness in the context of climate change (<i>Link to agricultural EIP. Coordinate efforts across countries with support through long-term funding of > 4 years. Knowledge networks, possibly combined later within a single knowledge hub</i>) Research should not only target major crops, but also minor crops to favour crop diversification opportunities. Link to ANIHWA</p>		<p>ERA-NETs</p> <p>2.3.1 Core-Organic III, Organic Agriculture ERA-NET [+]. Reducing the environmental effects of organic agriculture throughout the value chain and also Functional biodiversity to improve management of pests and diseases and Plant/Soil Interaction</p> <p>2.3.2 Precision agriculture and ICT ERA-NET [+]. Targeted collaboration on crop diversification, crop mixtures, multi-component agriculture, precision livestock farming, and adaptation of inputs to climatic variability and to GHG mitigation goals</p> <p>2.3.3 IPM, Integrated Pest Management ERA-NET [+]. Targeted collaboration on emerging pests and diseases and on climate change adaptation of IPM strategies (link through to CT4)</p> <p>2.3.4 ERA-CAPS ERA-NET, Advanced plant sciences [+]. Targeted collaboration on drought, heat and salt tolerance of crop and pasture species, on root symbioses and on primary productivity adaptation to elevated CO₂. Link through to CT4</p> <p>2.3.5 New ERA-NET: Achieving a sustainable bio-economy. Integrated approaches to overcome current barriers in bio-economy supply chains and sustainably produce bio-energy and bio-materials while maintaining food production and increasing soil/biomass carbon stocks through the development of innovative knowledge intensive farming systems and land management at landscape to regional scales. Such systems combine food, feed, bio-energy and bio-based products, recycling organic wastes, residues from agricultural production (i.e. manure management) and producing and processing bio-resources for industries. Special attention will be paid to GHG mitigation vs. fossil fuel substitution, to indirect land use change impacts and to climate change adaptation (i.e. FAO Global Agenda of Action 'From Waste to Worth'). Link to PPP Bridge</p> <p>COLLABORATIVE PROJECTS</p> <p>2.3.6a. Breeding for disease resistant crop genotypes adapted to local conditions and deploying resistance genes in landscapes and European regions to maximize their efficiency and their lifespan. Special attention will be paid to emerging plant diseases in the context of climate change. Link with EIP, e.g. for on-farm-bred varieties</p> <p>2.3.6b Developing novel vaccination methods and breeding for robustness (to infectious diseases) in livestock and aquaculture species. Special attention will be paid to emerging animal diseases in the context of climate change. (Link to FACCE ERA-NET+)</p> <p>INFRASTRUCTURES</p> <p>2.3.7 Infrastructure (I3). Conservation and use of plant genetic resources (including wild plant relatives). Access to genetic resources and (meta)data. Link through to CT4, preserving the genetic potential for adaptation</p> <p>2.3.8 Infrastructure (I3). Conservation and use of animal genetic resources also to enlarge the basis of adaptation to climate change. Access to genetic resources and to (meta)data. Link through to CT4, preserving the genetic potential for adaptation</p> <p>2.3.9 Infrastructure. Monitoring water availability and quality for agriculture at river basin level (Link through to CT4 adaptation). Such an infrastructure would have a high added value at EU scale to monitor changes in water resources as affected by climate change and by agriculture. Decision support tools for farmers in catchment areas will be developed. See also Water JPI</p>

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<p>Core theme 3 Assessing and reducing trade-offs between food production, biodiversity and ecosystem services</p>		
	<p>3.2.1 Better understanding of trade-offs (positive and negative) across ecosystem services at farm level and their economic effects at farm level (including agri-environmental schemes)</p>	<p>ERA-NET 3.3.1 BiodivERsA 2 ERA-NET. Targeted collaboration on biodiversity and agriculture [+] > 3.3.1 Joint call on ecosystem services in agricultural systems with BiodivERsA ERA-NET [***]</p> <p>COLLABORATIVE PROJECTS 3.3.2 Integrated measurement and modelling of ecosystem services and their values in agricultural landscapes and assessment of the role of agri-environmental measures. This includes exploiting the adaptive capacity of herbivores in marginal grazing lands and associated services and improving productive grassland based systems</p> <p>3.3.3a Developing root symbioses in European farming systems. Research and novel technologies concerning N fixing symbioses and mycorrhizae, including inoculation and use of rhizosphere signalling technologies</p> <p>3.3.3b Soil, the last frontier. Functional soil microbiology for productivity and nutrient cycling. Plant symbiotic micro-organisms in the rhizosphere beneficial for plant health and plant growth</p> <p>INFRASTRUCTURE 3.3.4 Infrastructure. AnaEE (see www.anaee.com). AnaEE (Infrastructure for Analysis and Experimentation on Ecosystems) is part of the European Strategy Forum on Research Infrastructures Roadmap (2010) as a new distributed EU infrastructure for ecosystem research</p>

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Core theme 4 Adaptation to climate change		
<p>4.1.1 Knowledge Hub on plant disease epidemiology under climate change, concerning emerging pests and diseases. The intention is to strengthen existing data infrastructures and to develop participatory research (e.g. using smart phones and interactive tools to assess diseases and geo-localise damages), as well as epidemiological modelling</p>	<p>4.2.1 Animal health/animal diseases and GHG mitigation. Link through to CTS. If a link could be drawn between animal health status and GHG emissions intensity it would be useful. Although there are significant bodies of on-going research in the fields of animal health and in GHG emissions, there is need to facilitate links and synergies between the two in order to benefit GHG mitigation (link with GRA, ANIHWA)</p>	<p>ERA-NETs</p> <p>4.3.1 ANIHWA ERA-NET, Animal Health and emerging diseases, ANIHWA+ [+] (future ERA-Net under H2020). Emerging animal diseases in link with climate change</p> <p>4.3.2 ARIMNET 2 ERA-NET, Mediterranean agriculture [+]. Will exchange with FACCE in planning next call (climate change adaptation of Mediterranean agriculture)</p> <p>4.3.3 FACCE ERA-NET Plus. Climate Smart Agriculture [**]</p> <ul style="list-style-type: none"> - Breeding (see also 2.3.7) - Pests & diseases - Adaptive water and soil management - Assessing options for increasing agricultural systems resilience - Relocating production systems and associated infrastructures - Socio-economic issues are cross-cutting <p>COLLABORATIVE PROJECTS</p> <p>4.3.4 Precision water management in crop production at farm and catchment scales. Assess the potential for water savings in European agriculture combining improved irrigation infrastructures and technologies, deficit irrigation, water reuse, sensors and remote sensing, ICT and changes in crop and livestock genotypes/species (farm and landscape level). Link with Climate KIC. Provide a roadmap for improved water efficiency by European agriculture (possible link with EIP and with JPI Water)</p> <p>INFRASTRUCTURES</p> <p>See 3.3.4 AnaEE (already under negotiation).</p> <p>For adaptation, need to emphasize the inter-operability of AnaEE across countries. For instance, monolith (i.e. intact soil blocks) transplant experiments for arable field crops and grasslands across sites (using e.g. a lysimeter design and elevated CO₂ through mini-FACE across the site network of AnaEE) would provide a novel understanding of the impacts of climate (space for time analogue is provided by transplantation) and its interaction with CO₂. This understanding is still lacking and is crucial for assessing impacts and adaptation</p>

Category 1 ALIGNING Mature research > Alignment instruments Including areas where research is scattered > Alignment at geographic or thematic level	Category 2 EXPLORING Emerging subjects > Scoping instruments (dialogue with stakeholders, inputs to category 3)	Category 3 INVESTING Need for common European efforts and developing research > Funding instruments (e.g. through collaborative projects, new ERA-NETs or infrastructures)
Core theme 5 Greenhouse gas mitigation		
	<p>5.2.1 Overcoming socio-economic and technological barriers to GHG mitigation in European agri-food chains</p>	<p>5.3.1 International call on agricultural greenhouse gas [**]</p> <p>New ERA-NET 5.3.2 ERA-NET on agricultural GHG research Monitoring and mitigation. Technical and economic potential of CH₄ and N₂O mitigation, carbon sequestration and reduced emissions from energy use and pre-chain inputs for GHG mitigation in European agricultural systems. Role of climatic variability and agricultural practices for GHG emissions (with ICOS). Reducing uncertainties and improving national agricultural GHG inventories. Assessing new tools for emissions/removals certification, economic and policy measures. Life cycle assessment. (link with Global Research Alliance on Agricultural Greenhouse Gases)</p> <p>COLLABORATIVE PROJECT 5.3.3 Increased soil carbon sequestration in arable systems and grasslands through changes in crop rotations and grassland management. Trade-offs with non-CO₂ GHG emissions and agricultural productivity (including issues like Biochar)</p> <p>INFRASTRUCTURE 5.3.4 Infrastructures. ICOS. Consider how to reinforce N cycling studies and impacts on GHG balance in ICOS</p>

Annex: Cross-cutting issues

In developing actions, the following cross-cutting issues need to be systematically addressed, independent of thematic research subjects. To guide this process, five main transversal aspects are described below.

Regional aspects

The diversity in natural and societal conditions in Europe requires thorough consideration about regional needs and potential impacts of possible research and innovation lines that are considered for joint actions. Aspects to take into account are the climate and soil – with major differences between the North and South of Europe; the socio-economic and cultural dimensions – as adaptation capacities depend on GDP, educational level, policy commitment etcetera; and the specialisation of farming systems which varies considerably over Europe with some spots of highly specialised systems. Diversified agro-systems are potentially more resilient and can provide climate smart solutions. For each action to be undertaken, FACCE should do ex-ante assessment in order to address needs and potential impact including from regional perspectives. A possible research subject specifically targeting this horizontal aspect action is hotspots for vulnerability of the primary sector to climate change.

Level of scale

The appropriate selection of spatial and temporal scales mainly depends on the research questions and problems to be solved. No level can be ruled out (plot, farm, landscape; day, season, decade) a priori. There may be conflicts of interest between scales. These should not be overlooked but addressed properly when setting research priorities.

Position in the food chain

The different steps of the food chain (farmer – food industry – consumer) all present different challenges for sustainability and resource use efficiency. In this respect, the closing of cycles (nutrients, energy, etc.), the use of biowaste and the reduction of the ecological footprint are integral parts of the FACCE challenge. Technical and societal innovations may focus on specific steps of the chain. Some problems may be due to conflicts of interests between the different positions in the food chain and require a more integrated approach. These aspects must be clearly formulated in projects addressing the core themes.

Impacts for end users

Changes in agricultural practices often go slowly. Taking up of innovations, application of adaptive strategies and acceptance by end users are not self-evident. Collaboration of FACCE with the EIP is crucial in the frame of transfer of agri-knowledge to targeted end users. The impacts of research and innovation projects for final target groups such as individual farmers, extension services, users of agricultural products in the food, feed and biobased industries, consumers, and social organisations need to be considered in the selection and development of joint actions in FACCE and in aligning national programmes. Incentives such as funding, ambassadors, vouchers for research or targeted training programmes can stimulate faster uptake of innovation. The media may play an intermediary role in transferring agri-knowledge from scientists and experts to policies and society. The aimed impact for end users and a plan for dissemination and outreach should be clearly formulated in project proposals. In implementing the SRA, the StAB established in 2012 has an important advisory role.

Open data access and standardisation

Although data sharing and standardised methods are generally acknowledged to boost productivity and results, there is still much to be done on this front. The FACCE Knowledge Hubs are expected to contribute by including in their activities transnational work on common standards, interoperability and data sharing. Other planned and future FACCE actions will contribute as well to the alignment of data sharing policies through existing and new platforms at national and European level.

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