Agriculture Food Security and Climate Change

Report of

FACCE-JPI Mapping and Foresight

on

# Assessing and reducing trade-offs: food production, biodiversity and ecosystem services

*Options for strategic collaboration*

FACCE CSA Mapping Meeting 3

11th - 12th July, 2012

Dublin, Ireland

AGRICULTURE, FOOD SECURITY & CLIMATE CHANGE

The sectors of agriculture and forestry are highly exposed to climate change, since they directly depend on climatic conditions, while emissions from agriculture in the Union account for 14% of global greenhouse gas emissions. Climate change is also one of the main challenges to agriculture in feeding the world's population, which is expected to reach 9 billion by 2050. Global demand for food is expected to have increased by 50% by 2030 and to have doubled by 2050, at a time when demand for biomass for non-food purposes is predicted to grow strongly. Concerted actions are needed to prevent these combined risks from leading to irreversible damage, and to achieve sustainable food supply under changing climate conditions.

The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) brings together 21 countries and aims to improve the collaboration in research policies and research effort of its member countries to tackle these global challenges for Europe by aligning research programmes among Member States.

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This report could not have been conceived without all efforts and dedication of all the participating Member States of FACCE-JPI and all participants of the Mapping Meeting.



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# Contents

# Summary

Joint Programming is a member state-driven initiative to join forces in research and education to tackle societal challenges of common interest. *Food security, Agriculture and Climate Change* (FACCE) is such an area.

In order to identify joint programming opportunities and activities, *mapping* exercises are performed through meetings in which delegates from participating countries meet to exchange information and views in order to create a common context. At mapping meetings *posters* are used to provide information on the research efforts and policy framework of each participating country.

This report describes the outcome of the third mapping meeting, which brought together 50 participants. Thirty country delegates from seventeen countries participated in moderated breakout sessions. Three members of the Scientific Advisory Board, members of the FACCE-CSA and the FACCE-JPI Governing Board and Secretariat as well as speakers from BiodivERsA ERA-NET, the FACCE JPI Knowledge Hub MACSUR and a research expert from the Wageningen UR of The Netherlands contributed to these discussions as well. The main aim of the break-out sessions and concluding plenary session was to identify gaps and overlaps, and opportunities for collaboration.

Since the topic addressed (*Assessing and reducing trade-offs: food production, biodiversity and ecosystem services*) requires a horizontal view, much effort was devoted to clarify concepts and approaches. The main issues identified are:

- The need to define **ecosystem services** concept and establish valuation methods.
- Assessment of **ecosystem services** through spatial and temporal scaling. Databases using previously defined parameters must be built by networking on demonstration areas (at a scale beyond the farm level) in order to address the optimisation of trade-offs between food production and other ecosystem services (biodiversity, landscape conservation...).
- **Interlinking between science and policy** was viewed as the basis to pursue the optimisation of trade-offs among different ecosystem services.
- **Land sharing versus land sparing** was considered an issue to be taken into consideration to approach the sustainable intensification of food production and resilience of farming systems.

These issues need to be addressed through interlinking and cooperation among different scientific disciplines (including social and economic sciences), policy makers and end-users (farmers), making an effort to use a common language.

**Tools identified** for a cooperative approach are:

- Networking (e.g. data collections and data sharing) on experimental farms at a large spatial and temporal scale involving scientists, policy makers and farmers.
- Networking to share knowledge through Knowledge Hubs as a tool to pool expertise and develop targeted projects. Training and coaching young scientists to undertake integrated approaches on functional biodiversity through interdisciplinary approaches (social, economic ...).
- Collaboration with ERA-NETs and other JPIs in order to establish links for mutual exchange of information with EIPs (such as EIP on Agricultural Productivity and Sustainability) and deliver recommendations for future Horizon 2020 work programmes.
- Exchange of existing knowledge to different users (farmers, decision makers ...) followed by a bottom-up feedback.

# 1. Introduction

### Strategic collaboration between Member States

The Joint Programming Initiative on Food Security, Agriculture and Climate Change (FACCE-JPI) brings together 21 countries with the aim to enhance the cooperation and alignment of research efforts and policies among the member countries. This is essential to tackle global challenges that Europe is facing.

Within the Coordination and Support Action for this JPI (FACCE CSA), Work Package 2 (WP2) is conducting Mapping and Foresight activities for Strategic Collaboration. The goal of WP2 package is to support the FACCE-JPI in the development of a strategic research agenda that should be implemented through the collaboration among Member States.

The mapping and foresight activities of FACCE JPI are organised in the framework of the coordination and support action FACCE-CSA, coordinated by INRA and BBSRC. These mapping activities are organised by three of the CSA partners: Wageningen University and Research Centre (Wageningen UR); the Ministry of Economic Affairs, Agriculture, and Innovation (EL&I) from The Netherlands; and the National Institute of Agriculture and Food Research and Technology (INIA) from Spain.

This report describes the aim of the mapping and foresight activities, the scope and boundaries for the third mapping meeting on *Assessing and reducing trade-offs: food production, biodiversity and ecosystem services,* the output of the break-out groups and the general conclusions drawn. It also provides a summary of the presentations, and the compilation of information resulting from a desk study. The report ends with conclusions and recommendations to the Governing Board of FACCE-JPI.

### Mapping and foresight for strategic collaboration

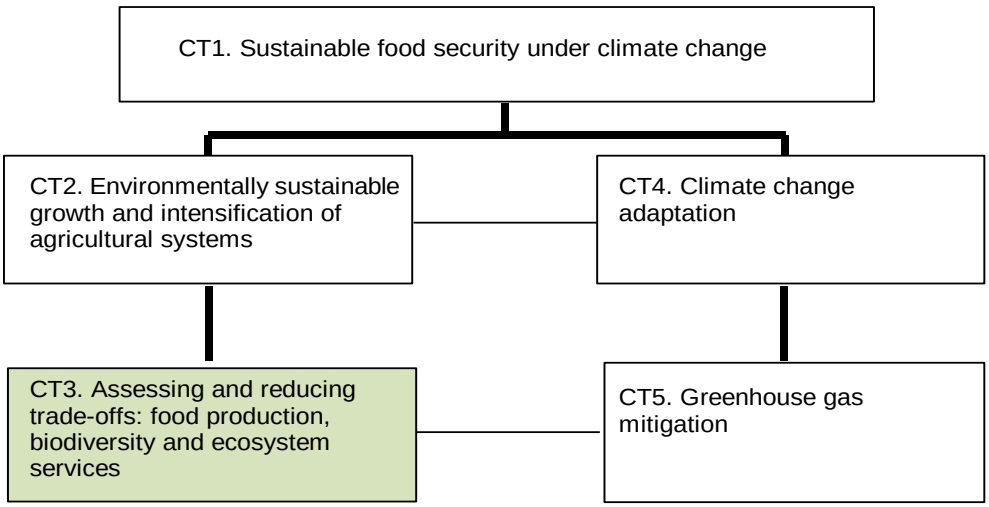
The objectives of WP2 are:

- Identification of complementarities, duplications, and gaps (in current and future research).
- Identification of areas for (improved) coordination, cooperation and exchange (information, people, practices).
- Creation of a common context and opportunities for networking.
- Identification of perspectives and possibilities for pooling research resources (funding, people and facilities).
- Proposal of joint programming activities.

The mapping approach is based on the information provided by the participating countries which is discussed during the mapping meetings and compiled following a desk study (for additional information see reports on mapping meeting 1 and 2: http://www.faccejpi.com/Document-library/Mapping-meeting-reports)

### Five core themes; five mapping meetings

The five core themes (CTs) and their interconnections adopted by the Scientific Advisory Board (SAB) are as follows:




The theme of the first mapping meeting was on CT5 *Greenhouse gas mitigation*. The meeting was held on 20-21 June 2011 at the Ministry of Economic Affairs, Agriculture and Innovation in The Hague, the Netherlands. The report is available at http://www.faccejpi.com/Document-library/Mapping-meeting-reports.

The theme of the second mapping meeting was on CT4 *Climate change adaptation*. The meeting was held on 22-23 February 2012 at the National Institute of Agriculture and Food Research and Technology (INIA) in Madrid, Spain. The report is available at http://www.faccejpi.com/Document-library/Mapping-meeting-reports.

This report describes the results of the third mapping meeting, on CT3 *Assessing and reducing trade-offs between food supply, biodiversity and ecosystem services* that took place at the facilities of the Backweston Campus at Celbridge of the Department of Agriculture, Food and Marine of Ireland, on 11-12 July 2012.

**Posters**

In the mapping meeting we used the information that was provided on structured posters. Each participating country was asked to provide information in two posters; one poster containing information on on-going scientific research programmes and the other poster on research policy/funding. The Governing Board members of the participating countries were responsible for the nomination of delegates and the accuracy of the information provided.

**Group discussions**

The country delegates and experts attending the mapping meeting had the opportunity to request clarification from their counterparts and to highlight in a consensual manner the most relevant issues and conclusions. The organisation of the group discussions is described in Annex 3.

**Desk Study**

In addition to the information generated during the meeting, the information available in the posters was subjected to a desk study, following the same approach used in conventional mapping exercises based on information gathered through questionnaires. This provided additional insight for identifying/verifying complementarities and gaps.

# 2. Third mapping meeting on "Assessing and reducing tradeoffs: food production, biodiversity and ecosystem services"

## 2.1 Meeting approach

The meeting brought together science and research policy representatives from seventeen countries who acted as country delegates. Furthermore, the Scientific Advisory Board, the ERA-NET on biodiversity BiodivERsA, the FACCE - JPI Knowledge Hub MACSUR and an expert from the Wageningen University, who kindly accepted our invitations, gave introductory presentations on the subject and participated in the overall meeting activities.
The meeting was hosted by the Department of Agriculture, Food and Marine of Ireland and held at the facilities of the Backweston Campus at Celbridge (Kildare County), near Dublin.

After the introductory presentations the participants analysed the information on funding programmes and research projects of the participating countries provided in the posters. This information, for which each of the Member States were responsible, had been distributed a week before the meeting to all participants. Country delegates, invited speakers and some Governing Board members were divided into seven working groups in which the funding and scientific information of the participating countries was analysed with the aim of identifying gaps, overlaps and to propose recommendations and topics for future joint actions. Each group presented a report in the plenary discussion. A second break-out session took place on the second day, after which all the results were again analysed in order to draw conclusions and recommendations.

In addition, the participants had the opportunity to attend the Euroscience Open Forum 2012 that was being held on 11-15 July in Dublin. Rogier Shulte from Teagasc kindly joined our meeting to provide appropriate announcements related to the JPI.

## 2.2 Scope and boundaries

The thematic scope of the third mapping meeting was the CT3 of the Scientific Research Agenda: **Assessing and reducing trade-offs: food production, biodiversity and ecosystem services.**

This topic as defined by the Scientific Advisory Board should:

- Provide new approaches to the increased use of functional biodiversity in agricultural systems (e.g. intercropping, mixtures, conservation agriculture…)
- Developing methods for assessing and valuing biodiversity and ecosystems goods and services (e.g. carbon sequestration, water storage…) in intensive agricultural systems;
- Develop approaches for optimising the trade-off between agriculture and ecosystem services in a variable environment (climate change, volatility…) and at farm scale;
- Develop a solid knowledge basis for the provision of public goods by European agriculture, so that ecosystem services are delivered efficiently and effectively.

## 2.3 Conceptual framework

To assess and reduce trade-offs between food supply, biodiversity and ecosystem services a three-level approach can be considered (see illustration):

1) Ecosystem services are composed by numerous single issues (biodiversity, genetic resources, water dynamics, biomass...). On a first approach it is necessary to analyse each one and define their position

in the agricultural production dynamics (focusing on each type and level: *crops*, *forestry*, *livestock*/*fisheries*).

2) Ecosystem services can be understood as a whole ecological complex. From a farm to a landscape level (up-scaling), land uses should be defined (i.e. in the case of land use sharing vs. sparing). To cope with a maximised agricultural production it is mandatory to *update the present agricultural production systems* and adapt the corresponding transitions.

3) Ecosystem services can be assimilated to systems that offer added values to the society. Therefore, methods of valuing should be developed. When integrated into *agricultural production systems*, economic, social and ecological values rise.

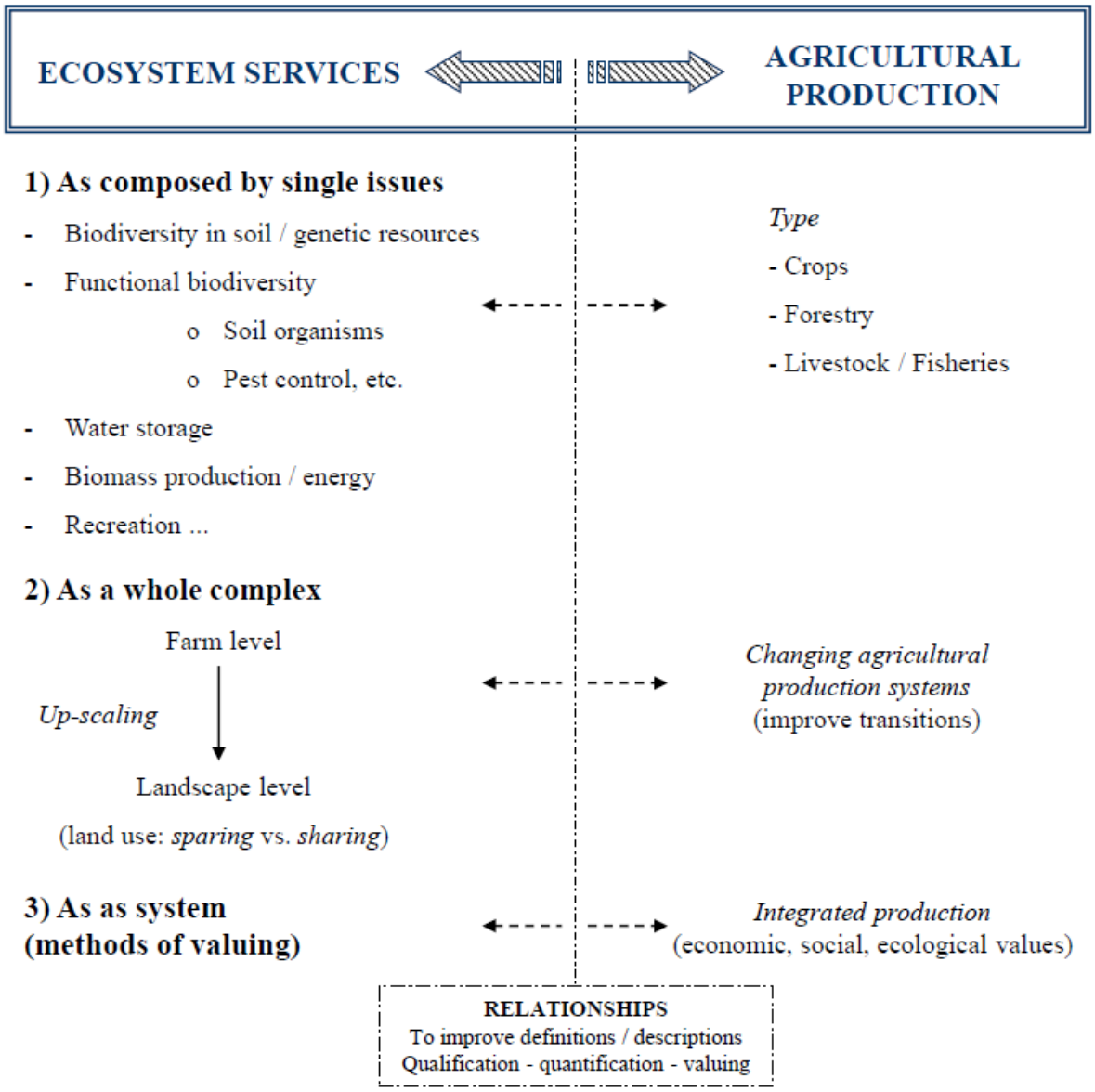
It is worthy to note that the transition 1) to 3) implies a *qualification – quantification* and a final *valuing* of the *concept* of ecosystem services.

We are facing an increasing variability of production conditions: natural, social, climate change-induced and economic/financial. The challenge is to mitigate and manage associate risks. A main question is: How do biodiversity and ecosystem services confer resistance, resilience and adaptability in food production systems? To address this challenge, we need learning environments beyond existing demonstration and experimental farms, i.e. *agricultural landscapes for monitoring, experimentation and demonstration* which have the right size to measure and value agricultural and non-agricultural biodiversity and ecosystem goods and services and at the same time being socially recognizable entities.

And finally, how to transfer information to policy makers? An understandable concept of ecosystem system must be defined, together with the corresponding analysis of risks (medium-long term), and the criteria for interventions. To achieve this goal, communication at all levels of the society / food chain is recommended, taking advantage of special tools / instruments (see page 4).

## FOOD SUPPLY – BIODIVERSITY – ECOSYSTEM SERVICES

### How to assess and reduce trade-offs?




**How to transfer to Policy-funders?**

-To generate an understandable concept of ecosystem service
-To develop an accurate analysis of risks (medium-long term)
-To propose criteria for interventions

*HIGHLIGHTS:*

- To improve *communication / information*
  · Society level – all partners through the food chain
- To make use of special *tools* / new *instruments (knowledge hubs, experimental farms, networking, etc.)*

# 3. Additional information from a desk study on the poster information

In order to gain additional insight, the information provided in the posters was subjected to a desk analysis in order to identify/verify complementarities and gaps. Therefore the desk analysis focused on two main objectives:

1. Identification of research priorities on *Assessing and reducing trade-offs: food production, biodiversity and ecosystem services* as well as gaps, overlaps and emerging research lines.

2. Identification of Financing Agencies and Research Programmes.

The analysis of the information provided in the posters from the 17 participating countries (Austria, Belgium, Cyprus, Denmark, Germany, Estonia, France, Finland, Ireland, Israel, Italy, The Netherlands, Norway, Romania, Spain, Switzerland and United Kingdom) are summarised below

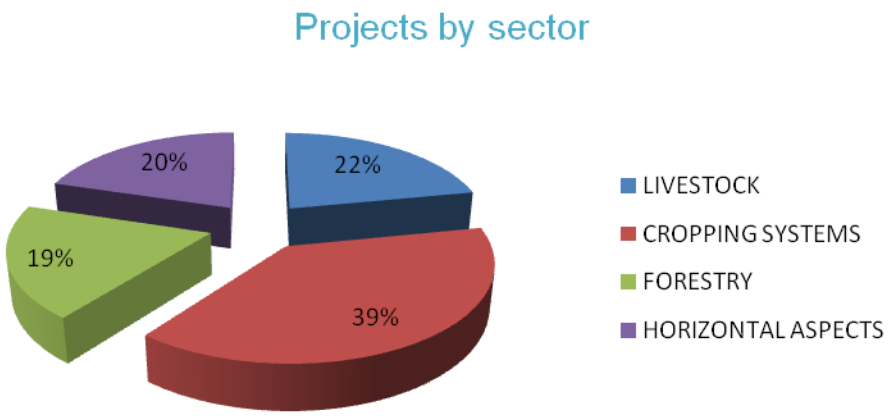
## 3.1 Overall analysis

The posters analysed provide information about the projects addressing trade-offs that had been carried out in the last three years in each of the participating countries.

### 3.1.1 Projects

The 1026 projects on *Assessing and reducing trade-offs: food production, biodiversity & ecosystems services* have been classified into the four sectors (Figure 1): livestock, cropping systems, forestry and horizontal aspects. Cropping Systems is the sector where more projects have been carried out in the last three years (396). The remaining sectors, Livestock (225), Horizontal Aspects (208) and Forestry (197), share a similar number of projects.

**Figure 1**

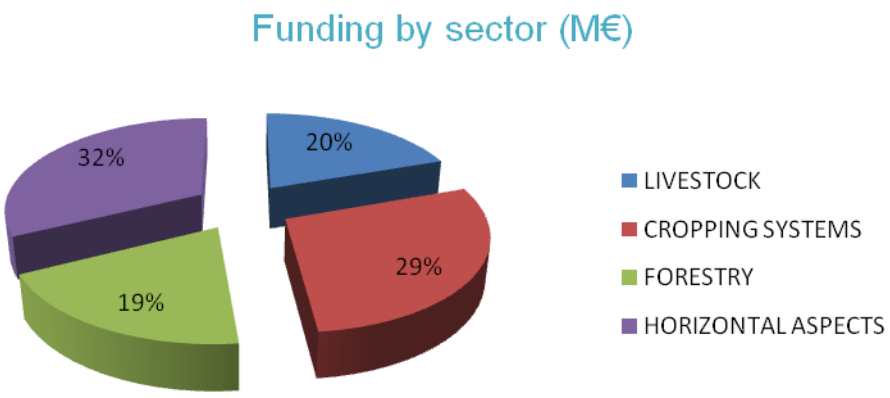



Regarding the **funding by sector** (Figure 2), Horizontal (political and socio-economic) Aspects are the most funded (77.1 M€), followed by Cropping Systems (68.3 M€). From this information, it can be inferred that

projects on Cropping Systems tend to be small (less funding), in spite of the large number of projects. Livestock and Forestry projects receive similar amounts of funding (46.8 and 46.0 M€).

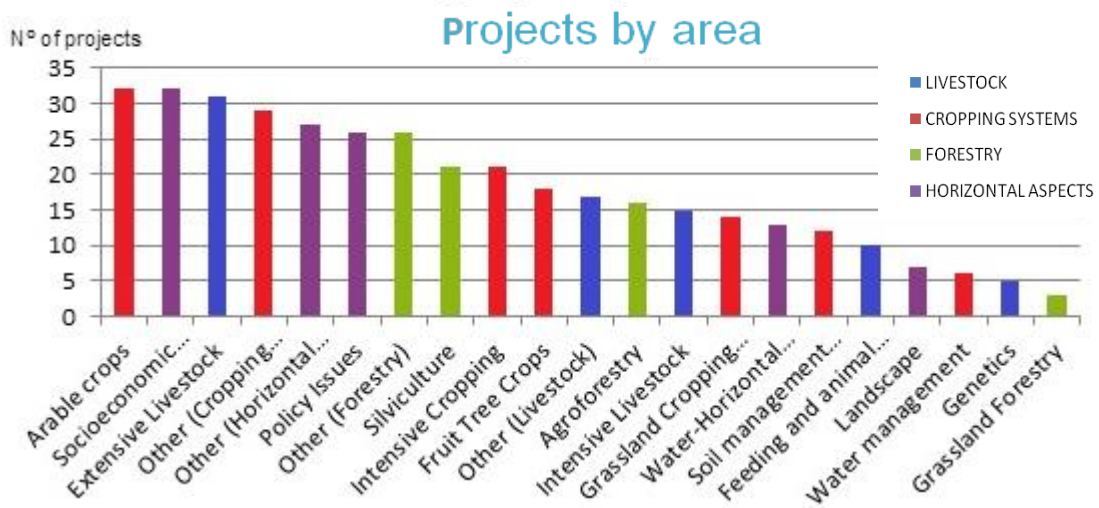
Some countries have provided incomplete data about their total funding (IT, RO, UK, BE and FI). Therefore the results provided here do not take into account information of these above-mentioned countries.

**Figure 2**



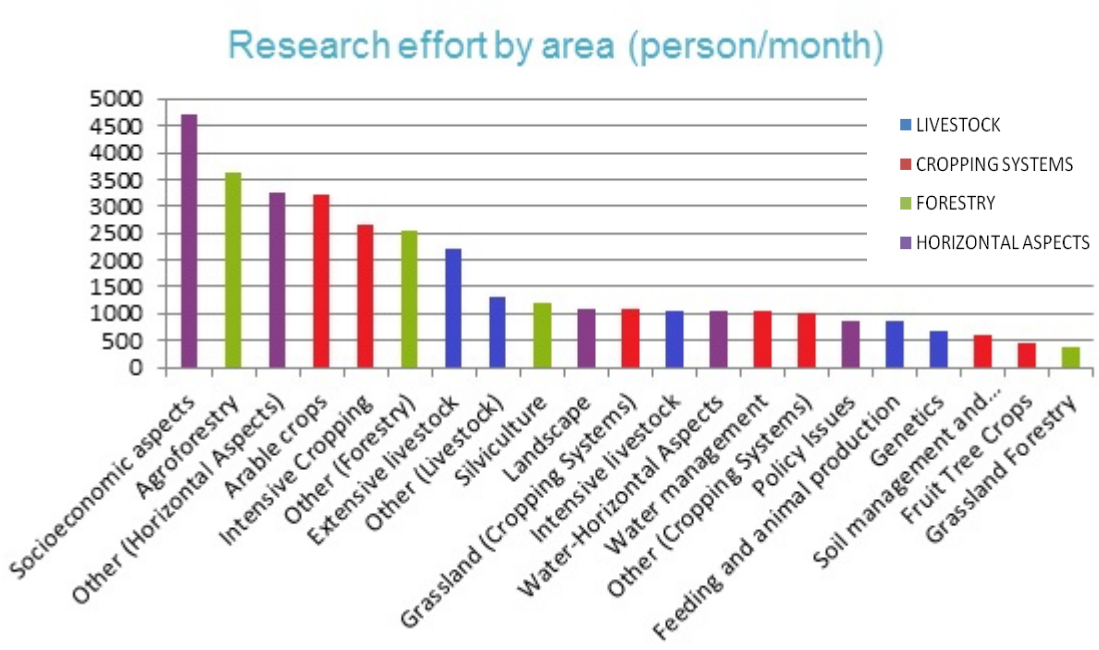

The ranking (Chart 1) illustrates the **areas with more projects** within the different sectors. A total of 21 relevant research areas have been identified. The most important ones are Arable crops (Cropping Systems sector), Socioeconomic aspects (Horizontal Aspects sector) and Extensive animal production (Livestock sector). It is of note that a large amount of projects have been classified in "Other" areas (either in Horizontal aspects, Cropping systems, Livestock and Forestry). From this, it can be inferred that projects on trade-offs are very difficult to classify, as this is a very broad and cross-sectorial topic.

**Chart 1**



The **research effort by area** has been measured taking into account the number of person-months involved in the projects of each area (Chart 2). Out of 21 areas, socioeconomic aspects is the one with the largest research effort (more than 4500 person-months) followed by agroforestry (more than 3500 person-months).
Some countries (IT, RO, UK, FI, FR, IL, NL, and NO) have provided incomplete information about the research effort of their projects. Hence the results provided here do not take into account all the information of the above-mentioned countries.

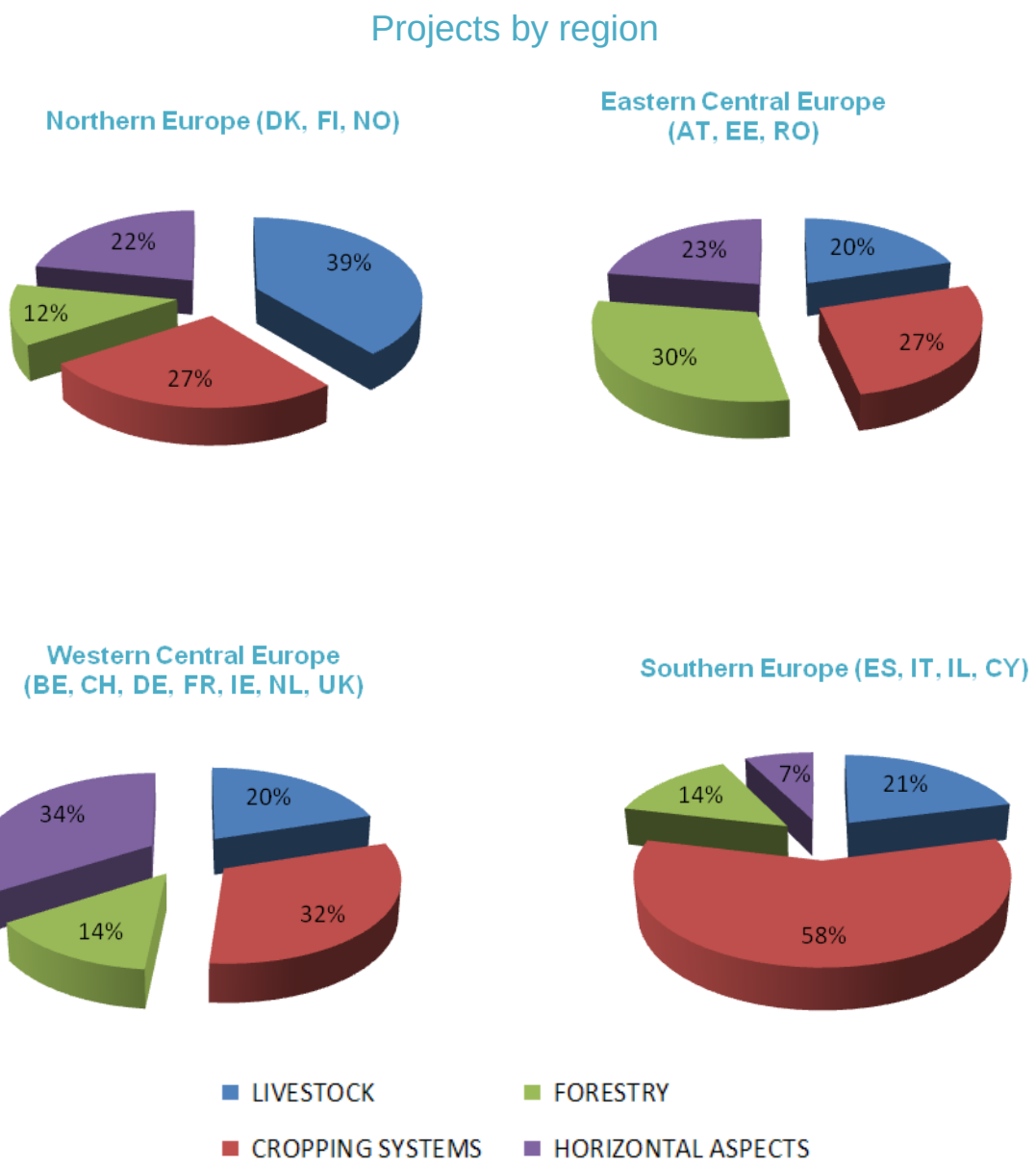
**Chart 2**




## 3.1.2 Distribution by region

The analysis of the previous information from a regional perspective (taking into consideration different clusters of countries within Europe) provides the following results (Figure 3). The **distribution of projects (considering each sector) within the different regions** is shown in Figure 3. It is remarkable that Cropping Systems sector is very important in all the regions, but especially in Southern Europe (58%). Regarding Horizontal Aspects sector, it is the most important in Western Central Europe (34%). On the other hand, the Livestock sector is more important in Northern Europe (39%) than in the other regions (Southern Europe 21%, Eastern Central Europe 20% and Western Central Europe 20%).Finally there are many projects devoted to Forestry in Eastern Central Europe (30%) and much less in the other regions (14% in Western Central Europe, 14% in Southern Europe and 12% in Northern Europe).

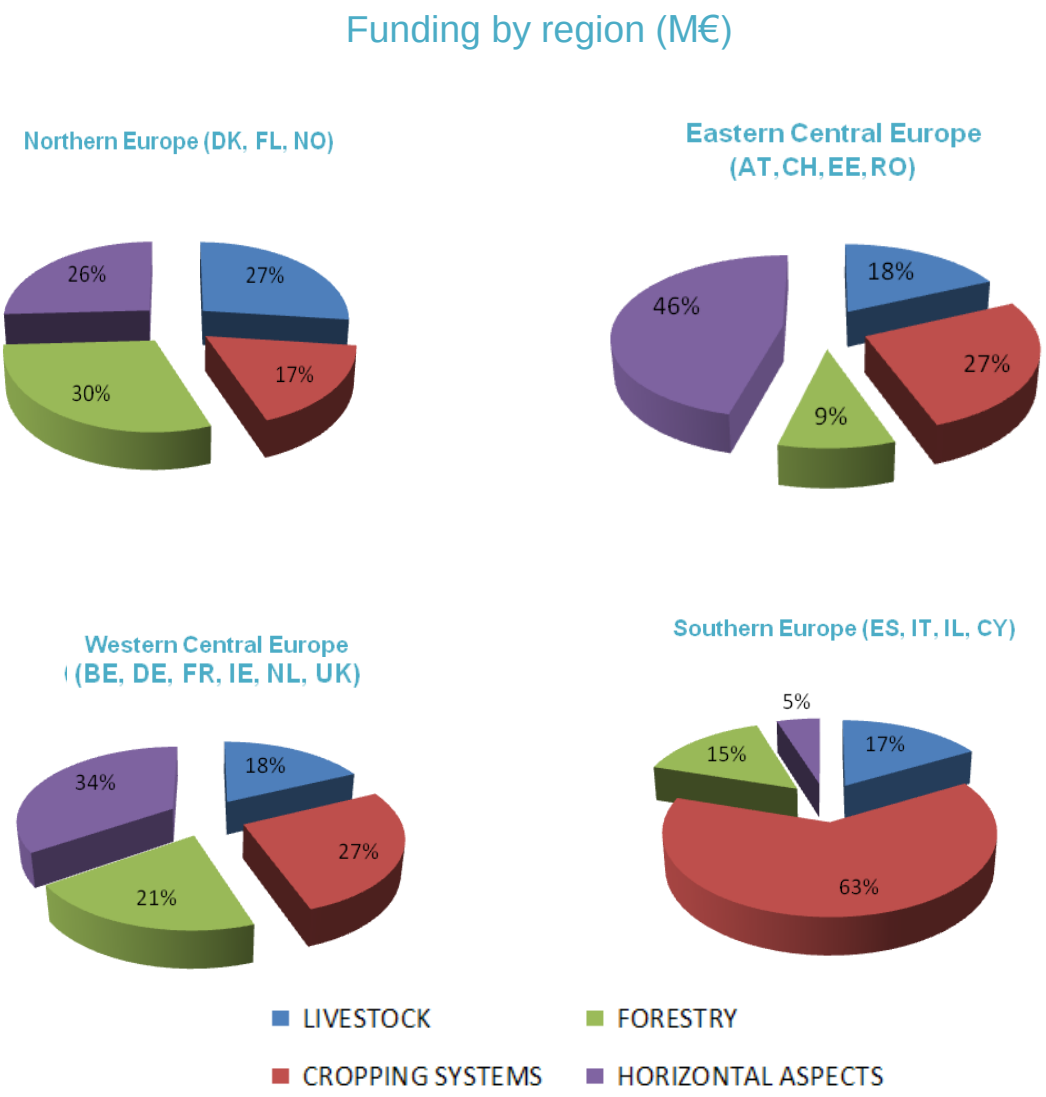
**Figure 3**




The analysis of funding information (Figure 4) shows that in Western Central Europe and Southern Europe the amount of **funding allocated to each region** is related to the number of projects. Nevertheless this is not the case in Northern Europe and Eastern Central Europe. In Northern Europe the Forestry sector is the most funded in spite of the relatively low number of projects. A similar situation is found in Easter Central Europe regarding the Horizontal Aspects sector, which represents only 23% of the projects but 46% of overall funding.

Some countries have sent incomplete data about their total funding (IT, RO, UK, BE and FI). Therefore the results provided here do not take into account all the information of the above mentioned countries.

**Figure 4**



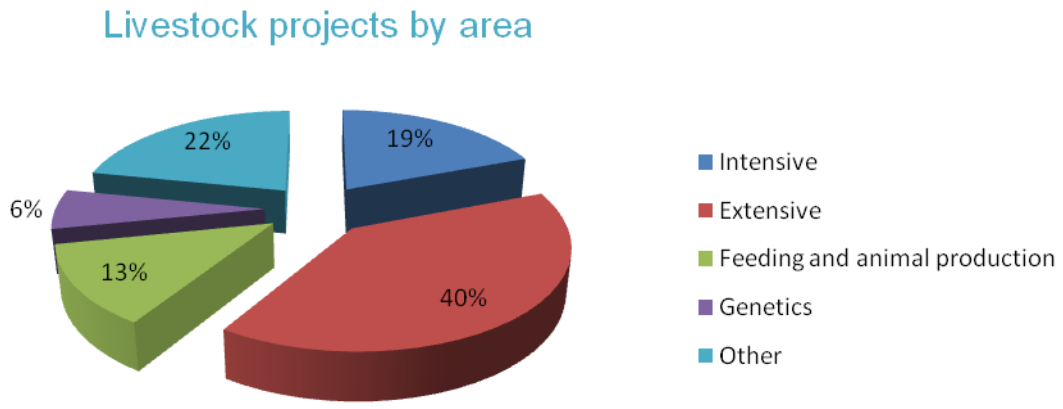

## 3.2 Analysis by sectors

Within the core theme Assessing and reducing tradeoffs: food production, biodiversity & ecosystems services, the five sectors identified (Livestock, Cropping systems, Forestry and Horizontal aspects) could be divided into specific areas. Hereunder, the analysis of the projects carried out in the last three years in each of these five sectors, regarding their areas and their distribution by region can be summarised as follows:

### 3.2.1 Livestock sector

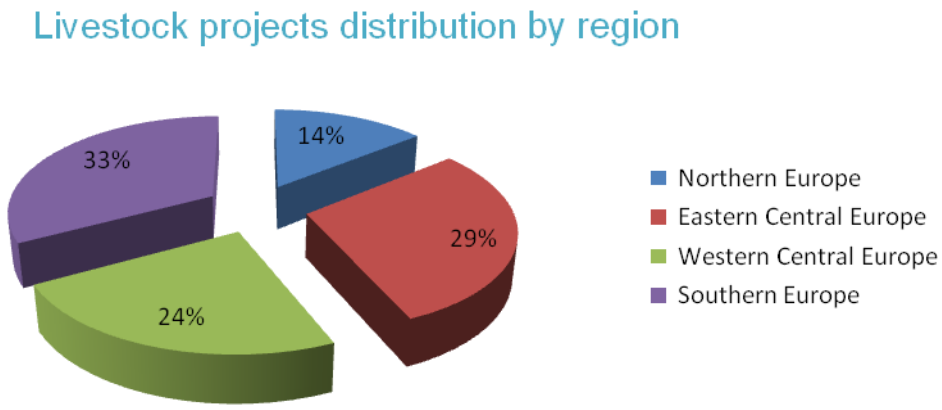
A total of 5 areas of research with 225 projects have been identified within the livestock sector.
As illustrated below (Figure 5), the major area identified is **Extensive animal production**, with 40% of the projects carried out in the sector. This area is followed in importance by **Intensive animal production (19%).** Little activity has been identified in the remaining areas such as **Feeding and animal production** and **Genetics** (13 and 6% respectively). It has to be noted that 22% of the projects have not been included in any defined area, thus they have been gathered as "**Other projects**".

**Figure 5**




As shown below (Figure 6) it should be noted that the activity undertaken in the livestock sector is quite similar in Southern Europe (74 projects), Eastern Central Europe (66) and Western Central Europe (53). This is not the case of Northern Europe, with only 32 projects in this sector.

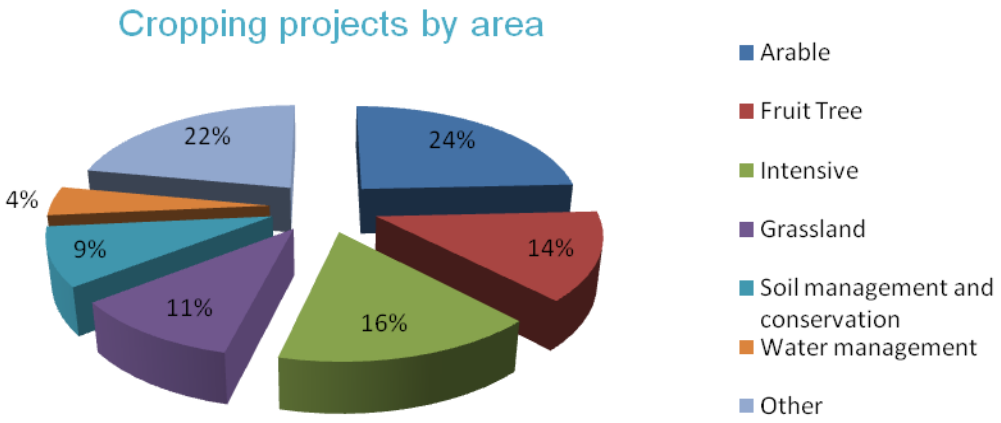
**Figure 6**



### 3.2.2 Cropping Systems sector

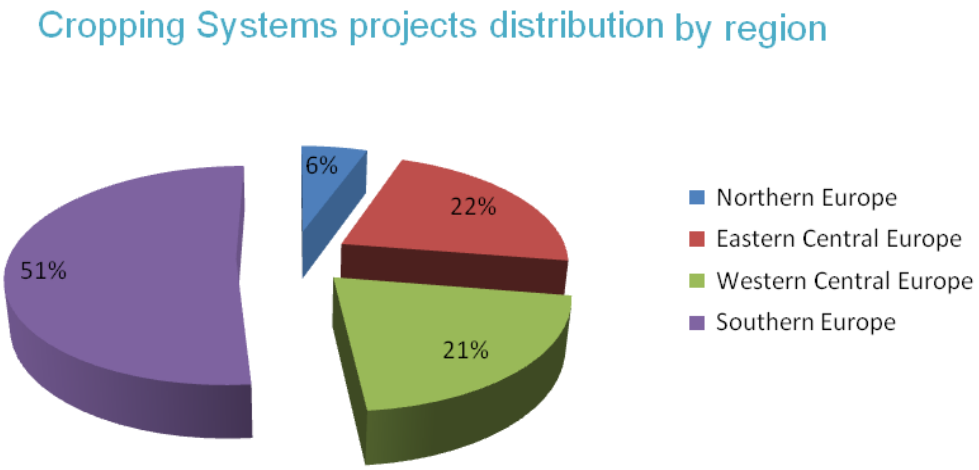
Seven areas of research with 396 projects have been identified within the Cropping Systems sector. As shown below (Figure 7), the major area identified is **Arable crops** (24% of total projects). The next groups in ranking importance are **Intensive crops** and **Fruit tree crops** (16% and 14%, respectively). There are three additional areas with little activity: **Grasslands** (11%), **Soil management and conservation** (9%) and **Water management** (4%). 22% of the projects have been gathered under "**Other projects".**

**Figure 7**




Regarding distribution by region (Figure 8), more than half of the projects undertaken in the Cropping Systems sector are in Southern Europe (204 projects). Eastern and Western Central Europe have a similar share (87 and 83 projects respectively), while only 6% of the projects carried out in the sector are undertaken in Northern Europe (22 projects).

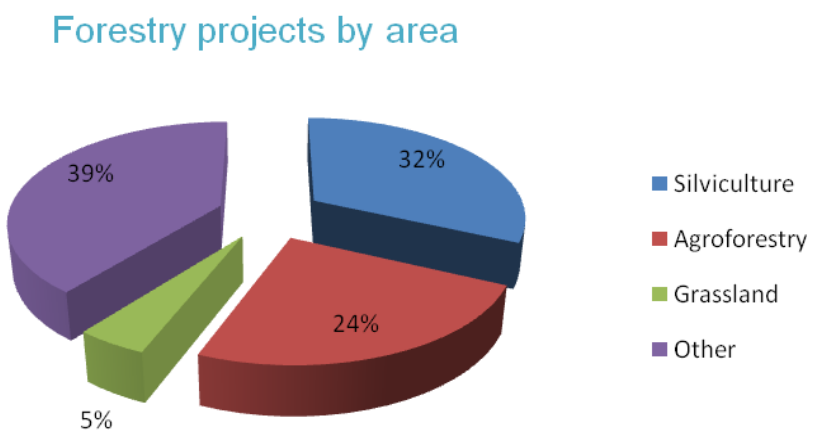
**Figure 8**



### 3.2.3 Forestry sector

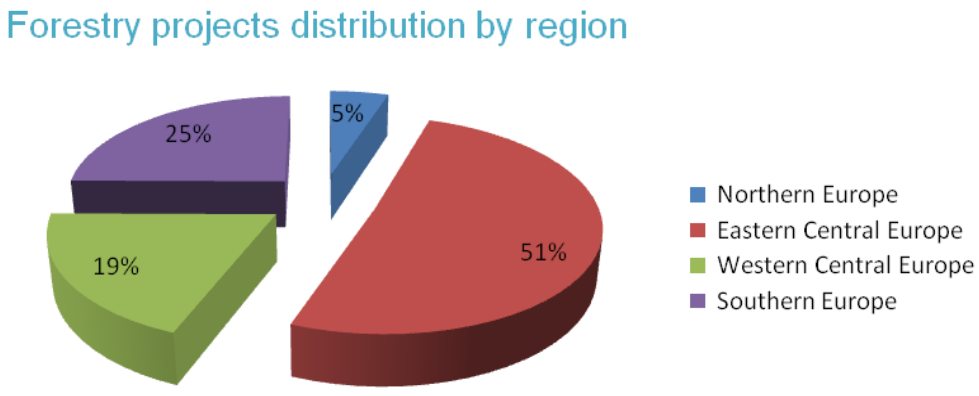
Four areas of research with 197 projects have been identified within the forestry sector. As illustrated below (Figure 9), **Silviculture** is the most important area (32%), followed by **Agroforestry** (24%). The area with less activity is **Grasslands**, with only 5% of the total number of projects. Many of the projects are classified as "**Other projects"** (39%). This is probably due to the difficulty to classify trade-off projects, as this is a very broad and cross-sectorial topic.

**Figure 9**




As illustrated below (Figure 10), in the Forestry sector more than half of the projects are undertaken in Eastern Central Europe (100 projects), followed by Southern Europe (49 projects) and Western Central Europe (38). Finally, only 5% of the projects are carried out in Northern Europe (10 projects).

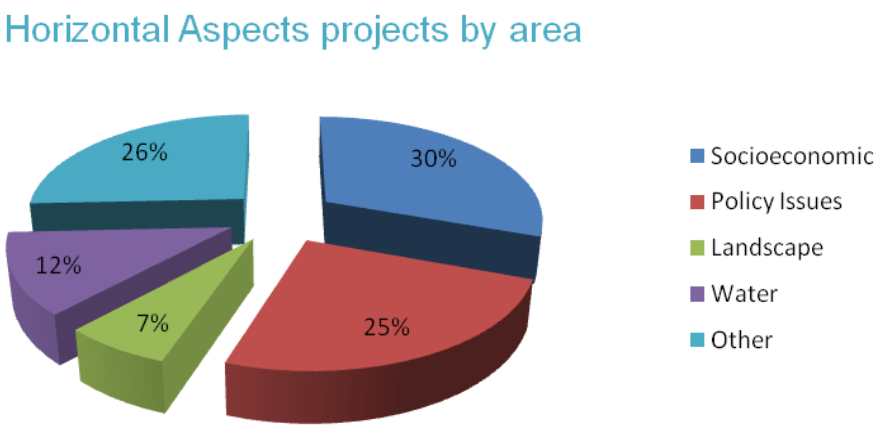
**Figure 10**



### 3.2.4 Horizontal Aspects sector

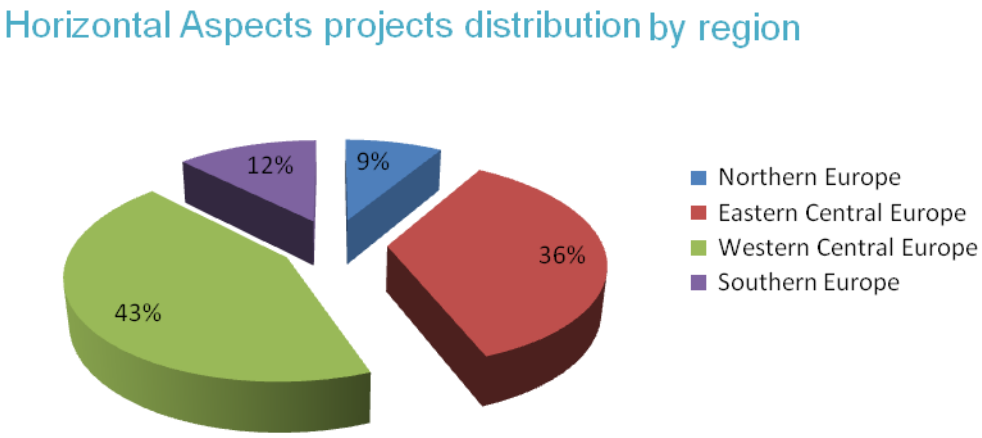
A total of 5 areas of research with 208 projects have been identified as Horizontal Aspects. As shown below (Figure 11), **Socio-economic aspects** (30%), **Other projects** (26%) and **Policy issues** (25%) are the most relevant areas within this sector. On the other hand, projects on **Water** and **Landscape** (12% and 7% respectively) are the least visible areas.

**Figure 11**




Regarding the distribution by region (Figure 12), it should be noted that most research activity takes place in Western and Eastern Central Europe (90 and 74 projects respectively) representing 79% of total. Projects in Southern and Northern Europe are only 21% of total (26 and 18 projects respectively).

**Figure 12**



## 3.3 Additional remarks

Based on the current number of projects and/or research effort, the following areas can be considered as **research priorities**: Arable crops, Socio-economic aspects (more than 25 projects in the last 3 years and more than 2500 person/month in total); Extensive animal production and Policy Issues (more than 25 projects in the last 3 years); Agroforestry and Intensive Cropping (more than 2500 person/month in total).

We can consider the next areas as **gap areas** (with low research effort and/or a low number of projects): Grassland in forestry (less than 6 projects and less than 500 person-months in total); Water management and Genetics (less than 6 project each); fruit tree crops (less than 500 person-months in total).

In order to define the degree of **overlapping** it would be necessary to know the specific objectives within each project, but in most of the cases this information was not available.

It is of note that many of the projects have been included in "Other" areas (either in Horizontal aspects, Cropping systems, Livestock and Forestry). This means that projects on trade-offs are very difficult to classify, as this is a very broad and cross-sectorial topic. As the poster provided a limited range of areas, the countries included many unclassifiable projects in "Other" area. It would be desirable for next mapping meetings to specify the area to which one project belongs, even if this area is not specified in the poster, rather than include it in the "Other" hub.

In order to evaluate the effort made by each country in specific areas, information regarding funding and research effort (person-months) per year was requested. Unfortunately, many countries were unable to provide this kind of information. Given that the costs of certain items and personnel in particular vary from country to country, it would be desirable in the future to emphasise the importance of providing an accurate estimate of such input for comparison purposes.

Regarding FP7, 17 projects related to trade-offs have a total budget of 69.1 M€. The average EC funding has been of around 77% of the total cost (more information in annex 4).

As in the cases of Mapping Meetings 1 and 2, the attempts to identify/quantify the Financing Agencies and Research Programmes of the participating countries have shown a high heterogeneity and diversity of the existing financing and accounting systems. Thus, to compare this data is a very difficult exercise that provides inexact and unreliable conclusions.

# 4. Conclusions and recommendations to the FACCE-JPI Governing Board

## 4.1 Recommendations for research themes for joint actions

The main issues addressed in the group discussions and in the final general discussion can be outlined as follows:

**Ecosystem services: definition and valuation**. The concept of Ecosystem Services (ESS) was not viewed in the same way by all the participants. In this regard, agricultural production and therefore food production should be considered as an ecosystem service. Even though the "trade-off" among different ESS was not deeply addressed, the participants recognised that certain agricultural practices might affect other ESS (biodiversity, landscape conservation...) and even ESS as a whole. On the other hand, even the expression "trade off" was questioned because of its negative connotation. The main difficulty to assess and therefore to attempt reducing trade-offs among different ESS is the lack of methodologies and tools to valuate ESS. Methodologies to measure/quantify the impact of food and agricultural production are needed to evaluate farming systems and to establish cause-effect relationships. The main suggestion was to map and assess different ESS under different scenarios as a means to build data bases that might help to make adequate predictions in the future.

**Spatial and temporal scaling.** In order to assess ESS, demonstration areas are needed to collect data and build data bases based on networking. However, since farming systems have been mainly designed for agricultural/food production, demonstration areas must be built at a larger scale (beyond farm level). It is of paramount importance to scale observations and measurements from farm level to agricultural landscapes and eventually, to eco-regions taking into consideration climate differences, seasonal variations and different agro-ecological landscapes. We need to learn in environments beyond the existing demonstration and experimentation farms which must have the right size to measure and value agricultural and non-agricultural biodiversity and ecosystem goods and services. At the same time, stakeholders such as farmers' organisations should be taken into consideration because they are the main actors involved. Temporal scaling must take into account differences in weather, seasonal variations, predictions for the next decade and eventually, all aspects associated to climate change. Given the lack and/or limited knowledge on seasonal and temporal predictability, cooperation with JPI Climate is highly encouraged.

**Interlink between science and policy.** Interlinking among different scientific disciplines and between those and policy makers is crucial to achieve the broad scope of this CT. In order to achieve such interlinking, efforts should be devoted to use a common language, to share an understanding of the ESS concept (see paragraph 1) and to build together future scenarios. As an example of the importance of interlinking between science and policy, several groups indicated that in order to develop the "greening" approach entertained in the CAP reform, valuation data must be provided by scientists in order to be used by policy-makers and decision making entities. Information and data provided by the scientific community through cooperation efforts of experts in different disciplines is needed for the implementation of the CAP reform through adequate policies. Research in this field should be promoted through the JPI in order to develop policies and implement the "greening" approach of Horizon 2020.

**Land sharing versus Land sparing.** Land sharing can lead to a sustainable intensification (also referred as ecological intensification) associated with an increased agricultural production together with an increase of other ESS. On the other hand, land sparing can lead to another kind of intensification that takes into account only an increase in agricultural production. Probably there is not a single approach, and adequate policies should be made taking into consideration data obtained through the valuation of demonstration and experimental farms (see paragraph 2). The role of farmers as decision makers should not be disregarded and adequate policies are necessary. Policies should envisage implementation through taxation or through specific incentives but also taking into consideration demand by industry and the whole society.

**Food production versus mitigation/adaptation strategies.** Food production and optimisation of ecosystem services must take into consideration other relevant issues to cope with climate change. In this regard, adaptation strategies (risk assessment, regionalisation, etc.) and mitigation initiatives (carbon sequestration, soil dynamics, etc.) are crucial to adjust the trade-offs to future needs due to a changing environment.

In summary, we are facing an increasing variability of production conditions, as much natural, social, economic/financial as climate change-induced ones. The challenge is to mitigate and manage the associated risks. The scientific community must define how biodiversity and ecosystem services can confer resistance, resilience and adaptability to food production systems. To address such challenge it is essential to learn (networking to produce data) in environments beyond the farm scale. Thus, it is critical to foster interlinking among different scientific disciplines, policy makers and end users (farmers).

## 4.2 Recommendations for tools to undertake cooperative research

Based on the considerations raised above, the following recommendations were considered pertinent:

- Networking (e.g. data collections and data sharing) of experimental farms at a large spatial and temporal scale involving scientists, policy makers and farmers.
- Definition of standardised monitoring programs (ecological observatories, etc.).
- Evaluate the suitability of presently available gene/biodiversity banks to assist in reducing trade-offs between food production and biodiversity.
- Networking to share knowledge through Knowledge Hubs as a tool to pool expertise and develop targeted projects.
- Training and coaching young scientists to undertake integrated approaches on functional biodiversity through an interdisciplinary approach (social, economic, etc.).
- Collaboration with ERA-NETs and other JPIs in order to establish links for mutual exchange of information with EIPs (such as EIP on Agricultural Productivity and Sustainability) and deliver recommendations for future Horizon 2020 work programmes.
- Transfer of existing knowledge to different users (farmers, decision makers ...) followed by a bottom-up feedback.

# Annexes

## Annex 1. Programme of the mapping meeting

**FACCE JPI Mapping Meeting on Core Theme 3: *Assessing and reducing tradeoffs: food production, biodiversity & ecosystems services***

**11th – 12th July 2012. Department of Agriculture, Food and Marine, Backweston Campus, Celbridge, Co. Kildare, Ireland**

Chairs:
Richard HOWELL (FACCE GB member, Dept. of Agriculture, Food and the Marine, IE)
Frits MOHREN (SAB member, prof. forest ecology and management, Wageningen UR, NL)

Meeting rooms:
Plenary sessions are in the Conference room in Shared Services Building.
Breakout sessions are in the meetings rooms of Shared Services Building.

| **Wednesday July 11** | |
|---|---|
| 9:15 | Pick up at Clyde Court Hotel (formerly Berkeley Court Hotel), Lansdowne Rd, Ballsbridge, Dublin 4. (Bus to Backweston Campus) |
| 10:30–11:00 | Registration and coffee |
| 11:00–11:20 | **Welcome by chairs and organisation** |
| 11:20-12:30 | **Introductions and background**<br><br>Introduction on the theme of the meeting '*Assessing and reducing trade-offs: food production, biodiversity & ecosystems services'*<br>Frits MOHREN<br><br>Mappings by BIODIVERSA ERA-NET<br>Xavier LE ROUX (BiodivERsA)<br><br>Introduction FACCE JPI<br>Isabelle ALBOUY (JPI FACCE CSA coordinator)<br><br>Scope and aim of mapping exercises and this mapping meeting<br>Núria DURAN (JPI FACCE CSA WP2)<br><br>Programme for today and tomorrow and guidance for break-out session<br>Christine BUNTHOF (JPI FACCE CSA WP2) |
| 12:30-13:30 | **Studying posters** |
| 13:30–14:30 | Lunch |
| 14:30–16:00 | **Break-out session 1**<br>*For distribution in groups and rooms, see scheme in meeting binder*<br><br>Group discussion, using flip-over as note pad:<br><br>i. Share information of countries around the table on national research policies, programmes, funding, programmes and projects. |

| | |
|---|---|
| | ii. Identify gaps and overlaps and propose-prioritise areas and tools for joint action.<br>iii. Give recommendations for prioritised areas towards coordination between Member States (defining scope, scale, modalities – i.e. sharing resources, defining funding available and funding needed, etc.)<br><br>➔ Summarize the discussion outcomes in an electronic version of the *Break-out session Report Form* for the presentation. |
| 16:00-16:30 | Coffee break |
| 16:30-18:00 | **Reports by short presentations from break-out groups** |
| 18:00–18:15 | **JPI @ ESOF. Announcements**<br>Rogier SCHULTE (Teagasc) |
| 18:15 | Bus to Clyde Court Hotel |
| 20:30 | Meeting dinner at ***Il Segreto*** restaurant in Dublin city centre (13a / 13b Merrion Row, Dublin 2) |

| **Thursday July 12** | |
|---|---|
| 09:00 | Pick up at Clyde Court Hotel (formerly Berkeley Court Hotel), Lansdowne Rd, Ballsbridge, Dublin 4. (Bus to Backweston Campus) |
| 10:00-10:35 | **Plenary start of Day 2**<br><br>Scientific scenario's for addressing trade-offs<br>Lijbert BRUSSAARD (Wageningen UR)<br><br>How the FACCE JPI Knowledge Hub MACSUR will take trade-offs into account<br>Martin KOECHY (executive coordinator MACSUR, University of Braunschweig)<br><br>Summary of break-out reports Day 1 and focus for Day 2 |
| 10:35-11:00 | Coffee break |
| 11:00-12:30 | **Break-out session 2**<br>*For distribution in groups and rooms, see scheme in meeting binder*<br><br>New groups following the same discussion approach as in Break-out session 1<br><br>➔ Summarize the discussion outcomes in an electronic version of the *Break-out session Report Form* for the presentation. |
| 12:30-13:30 | **Reports / short presentations from break-out groups** |
| 13:30–14:30 | Lunch |
| 14:30–16:00 | **Summary of breakout and general discussion** |
| 16:00-16:15 | **Concluding remarks** |
| 16:15-16:30 | Closing + Toast |
| 16:30 | Bus to Clyde Court Hotel |

## Annex 2. List of participants

| | COUNTRY DELEGATES | | |
|---|---|---|---|
| | **Country** | **Name** | **Representative** |
| 1 | Austria | Maria Keuschnigg | Policy |
| 2 | Austria | Michael Mirtl | Science |
| 3 | Belgium | Jan Staes | Science |
| 4 | Cyprus | Rebecca Chrysafi | Policy |
| 5 | Cyprus | Dora Chimonidou | Science |
| 6 | Denmark | Floor ten Hoopen | Policy |
| 7 | Denmark | Sussane Hede | Policy |
| 8 | Denmark | Claus Beier | Science |
| 9 | Estonia | Evelinv Loit | Science |
| 10 | France | Maurice Heral | Policy |
| 11 | France | Xavier Leroux | Science |
| 12 | Finland | Anna-Kaarina Peura | Policy |
| 13 | Finland | Roy Tubb | Science |
| 14 | Germany | Elke Saggau | Policy |
| 15 | Germany | Rolf Stratmann | Policy |
| 16 | Germany | Johannes Bender | Policy |
| 17 | Germany | Martin Köchy | Science |
| 18 | Ireland | Ciara Daly | Policy |
| 19 | Ireland | John Finn | Science |
| 20 | Israel | Anat Lewingrat | Policy |
| 21 | Israel | Yoram Kapulnik | Science |
| 22 | Italia | Anna Maria Marzetti | Policy |
| 23 | Italia | Roberta Farina | Science |
| 24 | Netherlands | Jeroen Vis | Policy |
| 25 | Netherlands | Lijbert Brussaard | Science |
| 26 | Norway | Kirsti Anker-Nilssen | Policy |
| 27 | Norway | Knut Anders Hovstad | Science |
| 28 | Romania | Nastasia Belc | Policy |
| 29 | Spain | Margarita Ruíz | Science |
| 30 | Spain | Domingo Iglesias | Science |
| 31 | Switzerland | Andreas Aeschlimann | Policy/Science |
| 32 | United Kingdom | Daniel McGonigle | Policy/Science |

| | OTHER PARTICIPANTS | |
|---|---|---|
| | **Organisation** | **Name** |
| 33 | DAFM | Richard Howell (Co chair) |
| 34 | SAB | Frits Mohren (Co chair) |
| 35 | SAB | Thomas Rosswall |
| 36 | SAB | Jean-François Soussana |
| 37 | TEAGASC | Rogier Schulte |
| 38 | FACCE JPI Secretariat | Isabelle Albouy |
| 39 | FACCE JPI Secretariat | Heather McKhann |

| | FACCE CSA WP2 TEAM & LOCAL ORGANISERS | |
|---|---|---|
| | **Organisation** | **Name** |
| 40 | DLO | Christine Bunthof |
| 41 | EL&I | Louis Fliervoet |
| 42 | INIA | Paloma Melgarejo |
| 43 | INIA | Mª José Delgado |
| 44 | INIA | Núria Duran |
| 45 | INIA | Pablo Aller |
| | DAFM | Richard Howell (Co chair) |
| 46 | DAFM | Carol Howard |
| 47 | DAFM | Siobhan Hoare |
| 48 | DAFM | Olivia Murphy |
| | DAFM | Ciara Daly |

# Annex 3. Break-out sessions

## Approach

During the two days of the mapping meeting the participants discussed in small working groups the content of the posters. The distribution in groups was such that 4-5 countries were represented, and that each group included science delegates as well as policy delegates. To enhance interaction within the whole group of participants and the exchange of information between countries, the distribution in groups on the second day was different from the first day.

The groups were moderated by members of the organising team, the FACCE CSA coordinator and two additional moderators with participation experience from the 1st and 2nd Mapping Meetings. Through the guidance of these moderators, people in the groups discussed the content of the posters (mainly focusing on their own countries) and trying to reach a series of objectives:

- to identify gaps, overlaps, complementarities, synergies, emerging research topics, research facilities;

- to define recommendations on research topics for joint actions, tools to undertake cooperation (research, coaching, communication, sharing facilities) and other possible suggestions.

As a result of this process, each group came up with suggestions and conclusions. They were collected by one reporter per group, using a pre-defined template. The reporters gave a presentation of the results in the plenary session that immediately followed the break-out session. The same approach was applied on the second day break-out. Moreover there was a plenary final discussion.

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 1**

Participants:
*Claus Beier (DK)*
*Dora Chimonidou (CY)*
*Ciara Daly (IE)*
*Elke Saggau (DE)*
*Johannes Bender (DE)*
*Isabelle Albouy (moderator)*

| GROUP 1 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Genetic resources & old races with less impact on ecosystem services (ESS).<br><br>Full chain view: productivity – trade offs (projects generally view a limited scope).<br><br>General understanding of interactions between farming & ESS + ESS valuation. | Animal welfare.<br><br>Biodiversity issues in Grasslands and Forestry.<br><br>Conservation of genetic variation in plants. | ERA-NETs (several).<br><br>Future crop pests. | Biological soil nutrient extraction (e.g. *Mycorrhiza* uptake of P).<br><br>Soil carbon sequestration and Long term soil fertility.<br><br>Closed cycle concepts in farming – farm and societal scale (industrial symbioses). | No common gene-bank and conservatories.<br><br>No common or general experimental approach & facilities.<br><br>No data sharing. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| "Closed cycle concepts" thinking and research in food production (from flow to cycle).<br><br>Long term soil carbon storage and soil fertility conservation. | Transfer recommendations to EU level (e.g. calls in Horizon 2020).<br><br>Common and coordinated research approaches and experimental infrastructures.<br><br>Common data and modelling platforms. | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 2**

Participants:
*Anna Karina-Peura (FI)*
*Xavier Le Roux (FR)*
*Lijbert Brussaard (NL)*
*Thomas Rosswall (SAB)*
*Margarita Ruiz (ES, co-moderator)*
*Paloma Melgarejo (moderator)*

| GROUP 2 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Scale issues: institutional, spatial and temporal.<br><br>Multiple ecosystem services.<br><br>Non market value.<br><br>Risk management in relation to trade off. | Impact of management on sustainability and biodiversity.<br><br>Ecological intensification.<br><br>Overlap is an asset, not a problem. | If the problem is general but with different regional solutions, regional points of view will be complementary.<br><br>Interdisciplinary: social and natural scientists - stakeholders. | Related to 1st and 2nd ideas of CT3.<br><br>Mixing varieties in field.<br><br>Multi-trophic interactions.<br><br>Shift bias from plants and pollinators.<br><br>Compartmentalisation, facilitation, trait based ecology.<br><br>Making use of biodiversity in agriculture.<br><br>Quantifying associations between biodiversity and ecosystem services. | Observation-monitoring facilities at adequate scales. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Mapping of ecosystem services (JRC atlas, but based of national mappings!!).<br><br>Cross cutting recommendation: include regional and interdisciplinary approaches wherever is appropriate. | Provide observation facilities at the adequate scales. | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 3**

Participants:
*Floor ten Hoopen (DK)*
*Daniel McGonigle (UK)*
*Michael Mirtl (AT)*
*AnatLewingrat (IL)*
*Andreas Aeschlimann (CH)*
*Frits Mohern (SAB)*
*Christine Bunthof (moderator)*

| GROUP 3 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Focus on mechanisms:<br><br>ESS mapping to be developed further as basis for decision making at different scales (scaling issues).<br><br>Mechanisms for managing trade-offs between ESS (e.g. water quality vs. intense agriculture, but also mechanisms as tools for the decision making on the farmstead level).<br><br>Increasing sociological research: how to translate EXISTING natural scientific research findings into better practice of sustainable agriculture in a USER SPECIFIC way ( e.g. translating research results for decision making in farming systems, but also supporting appropriate political decisions). | CRITICAL POINT: Agriculture is, BUT SHOULD NOT BE the main stakeholder in the field of trade-offs. | Group shares similar opinions on overall framework towards sustainable agriculture, which is adaptive in terms of energy efficiency, soil health etc. (IAASTD report 2008/ synthesis). | Markets for ecosystem services.<br><br>Evaluation of ecosystem services.<br><br>Lifecycle impact assessment of agricultural production and products (production, logistics, marketing, governance/ how policy is made). | Not addressed. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Mapping land capabilities and resilience for different ecosystems.<br><br>Measurable indicators for sustainable production.<br><br>Scaling issues. | Elaborate the mapping exercise of this workshop into a website for sharing information/knowledge. | Mainstream agriculture should not be a priority in this thematic field.<br><br>Involvement of sociologists, ecologists and economists (->interdisciplinary).<br><br>Each research proposal should be evaluated with respect to its contribution to further optimisation of diverse multifunctional, adaptive agriculture (conservation agriculture, “ecological intensification”, land use adapted to local conditions, adaptive agricultural land use).<br><br>Align research among specific countries/conditions (environmental and other gradients). |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 4**

Participants:
*Roy Tubb (FI)*
*Rebecca Chrysafi (CY)*
*Jan Staes (BE)*
*Jeroen Vis (NL)*
*Heather McKhann (INRA)*
*Jean-François Soussana (SAB)*
*Pablo Aller (moderator)*

| GROUP 4 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Flows of resources between countries.<br><br>Common definitions for ESS.<br><br>Development & alignment of methodologies for assessment (European approach).<br><br>EU Biodiversity Strategy.<br><br>Forestry & Ecosystems Service.<br><br>Land Sparing/sharing. | | Water management.<br><br>Regional approach.<br><br>Interdisciplinary approach. | Redefining the policy drivers.<br><br>Land use, spatial planning and circular economy.<br><br>Landscapes re-design.<br><br>Functional side of biodiversity. How to use it?<br><br>Soil, livestock, managed, surroundings, etc… | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| | Developing, integrating ecosystems services & LCA. | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 5**

Participants:
*Knut Anders Hovstad (NO)*
*Evelin Loit (EE)*
*Martin Köchy (DE)*
*Anna Maria Marzetti (IT)*
*Sussane Hede (DK)*
*Louis Flievoert (moderator)*

| GROUP 5 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Integrative approach, (sub-) national.<br><br>Valuation: economic, ecological, social.<br><br>Scaling: farm to landscape.<br>Take out conflict betw. agric. & ecosystem, agric. is an ecosystem.<br><br>Model including all ESS, quantify correlation of biodiversity indicators with impacts.<br><br>Which functional biodiv. is correlated with food production. | | Small-scale system-specific studies ➔ use common approaches.<br><br>Transition rural ➔ urban.<br><br>Trade-off food/non-food crops, effects on ESS. | Landscape level: use the same metrics.<br><br>Develop common methods to tackle gaps.<br><br>Transition from rural to urban societies, effects on farming systems & biodiversity.<br><br>Effects of new agric. technologies on ESS.<br><br>Effects of industry, food chain on ESS. | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| See *"emerging research topics"*<br>Trans-disciplinary approaches.<br><br>How to organise transitions to a more sustainable state.<br><br>How to minimise food waste.<br><br>Optimise the spatial distribution (within Europe) of where crops are grown, to fit with climate. | Share existing facilities.<br><br>Training young scientists in complex models to become integrative modellers.<br><br>Network of scientists, research institutions, industry along the food chain. | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 6**

Participants:
*Kirsti Anker-Nilssen (NO)*
*John Finn (IE)*
*Maria Keuschnigg (AT)*
*Domingo Iglesias (ES, co-moderator)*
*María José Delgado (moderator)*

| GROUP 6 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Livestock production X water, biodiversity and other ecosystem services.<br><br>Genetic and species diversity in the food chain.<br><br>Assessing and valuing the range of ESS across different agro ecosystems.<br><br>Stronger evidence and valuation of resistance, resilience and adaptation offered by biodiversity and ESS.<br><br>Effective knowledge transfer. | Intensive and extensive livestock production X carbon/ greenhouse gas emissions. | Water use and management in agro ecosystems.<br><br>ERA NETs e.g. BIODIVERSA and FOREST.<br><br>Standardised methodologies needed for assessing tradeoffs – beginning for Greenhouse gases, but needed for other ESS also. | Carbon sequestration in agro ecosystems.<br><br>Land use management.<br><br>Land use change: projections, consequences and impacts on food, biodiversity and ESS.<br><br>How do we achieve sustainable intensification for a range of ESS?<br><br>Valuing ESS within agro ecosystems. | Need for taxonomic expertise in biodiversity, including pests and diseases.<br><br>Co-ordination of research effort needed.<br><br>Need for high spatial resolution habitat mapping across the EU for projections of ESS supply. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Developing standardised methodologies for assessing ESS and their trade-offs within a range of agro ecosystems.<br><br>Investigate the function of biodiversity in agro ecosystems and its role in improving mitigation/adaptation /resilience to environmental change. | Improved communication between Ministries of Agriculture and Environment.<br><br>Improved communication between researchers in agriculture and environment and economics.<br><br>Improved funding for interdisciplinary co-operation e.g. natural and social scientists on horizontal issues.<br><br>Sharing of databases, facilities and computing. | Training events for young scientists.<br><br>Mobility and exchange of researchers.<br><br>Effective knowledge transfer<br>- Demonstration farms<br>- Highlighting of good examples<br><br>Strengthen efforts to provide common funding for common research objectives among national agencies. |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 1**

**Group 7**

Participants:
*Yoram Kapulnik (IL)*
*Nastasia Belc (RO)*
*Rolf Stratmann (DE)*
*Roberta Farina (IT)*
*Maurice Heral (FR)*
*Nuria Duran (moderator).*

| GROUP 7 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| No link economy-social scientist with biology-agronomy-soil etc scientist (France is a good exception).<br><br>Missing soil research programs.<br><br>Policy issues: solutions and the policies.<br><br>Methods for assessing and valuing biodiversity, ESS.<br><br>Tools to reduce trade-offs. | Genetic resources: wild, cultivated crops. | Improve collaborations.<br><br>Developing common methods. | Policies common approaches.<br><br>Ecological corridors for wild life.<br><br>Effect of agro mosaics on wild animals.<br><br>Modelling approach on complex systems with a multidisciplinary team. | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Joint actions-common policy.<br><br>Gene banks (common data bases, methods, of classification, etc). | | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**

**Group 1**

Participants:
*Claus Beier (DK)*
*Ciara Daly (IE)*
*Rebecca Chrysafi (CY)*
*Kirsti Anker-Nilssen (NO)*
*Maurice Heral (FR)*
*Louis Flievoert (moderator)*

| GROUP 1 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Soil functioning.<br><br>Long term vision for ecosystem services (indicators, methods for evaluation).<br><br>Connection with consumers' requests.<br><br>Integration methods at landscape scale for all the ESS (trans disciplinary-modelling). | | Exchange of data at farm level.<br><br>To develop a common conceptual approach at landscape level – connectivity. | Integration of socio-economic approach for ESS.<br><br>Closed circle concept, recycling, minimise impacts on biodiversity.<br><br>Water cycle, biodiversity impact. | Network of experimental farms. Specialisation and exchange of experimental plans.<br><br>Common data bases.<br><br>Modelling. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Up scaling.<br><br>Integrated approach. | Networking: exchange of best practices at landscape scale.<br><br>Coordination between ERANETs and JPIs to avoid overlaps.<br><br>Workshops, training of scientists (up scaling, recycling).<br><br>Marie Curie network. | Connection, education, training new practices to the farmers and to all the population (consumers).<br><br>How the best concept of trade-offs and ESS could be better shared in FACCE? |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**

**Group 2**

Participants:
*Johannes Bender (DE)*
*Lijbert Brussaard (NL)*
*Roy Tubb (FI)*
*Rolf Stratmann (DE)*
*Roberta Farina (IT)*
*Isabelle Albouy (moderator)*

| GROUP 2 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Research on relationships between ESS and Biodiversity. | | Integration at different scales: landscape scale, temporal scale, institutional-governance scale. | Define trade-offs and synergies between multiple ESS. | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Foster studies on social sciences: understanding across food chain / develop a common vocabulary / cultural challenges / Governance of social ecosystems (laws and policies). | To link landscape research infrastructures across Europe (sharing approaches/data, networks of research platforms). | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**

**Group 3**

Participants:
*Xavier Le Roux (FR)*
*Anat Lewingrat (IL)*
*Andreas Aeschlimann (CH)*
*Daniel McGonigle (UK)*
*Heather McKhann (INRA)*
*Nuria Duran (moderator)*

| GROUP 3 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Methods (regulations for region level, not farm-level; regional specifies and needs).<br><br>Common language to understand each other (science, society, industry). | | Intercropping<br><br>Green infrastructures<br><br>Combine programmes: CAP, EIP, Horizon 2020<br><br>Learn from low input systems, to comply better with ESS | | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Water aspects in ecosystems concerning different aspects e.g. biodiversity.<br><br>Overview of ecosystems in MS and the view and utilisation and plans for the future (needed for proper valuing) and its functionalities.<br><br>Topic on Mimicking nature. New models of ecosystem services. How to evaluate trade-offs in the whole ecosystem.<br><br>Identify traits for phosphorous/nitrogen uptake improvements from ecosystems and utilise<br>financial value of ecosystems/ services/ assessing it (biodiversity functions quantification, cultural system, defining ESS traits).<br><br>Production functions of ecosystem services, system analysis, integrated tools (to identify relationships, common databases) nutrient cycles. | Knowledge hub (new perspectives, synergies, identification of gaps, bring current research to new research concepts, bringing fragmented efforts together, inter/trans-disciplinary).<br><br>European Learning Network on functional biodiversity.<br><br>Suggestions for an ERA-NET where a lot of overlap is in the area in MS (trade-offs and synergies in the area of biodiversity).<br><br>BiodivERsA ERA-NET.<br><br>Applying ecological knowledge in agriculture, bringing knowledge together, new research questions will come up how to address this knowledge transfer/ utilisation. | |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**
**Group 4**

Participants:
*Elke Saggau (DE)*
*Dora Chimonidou (CY)*
*Floor ten Hoopen (DK)*
*Michael Mirtl (AT)*
*Jeroen Vis (NL)*
*Christine Bunthof (moderator)*

| GROUP 4 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Old adapted cultivars as basis for breeding (improve resilience).<br><br>Integrated crop production (local level).<br><br>Optimisation of sustainable/adaptive agriculture requires input from a range of "traditional" fields of research like use of legumes, crop rotation, mycorrhiza, closure of protein gaps....<br><br>Research on agricultural production systems fully based on renewable energy/bio-based economy.<br><br>Applied research on ESS mapping methods as basis for assessing potential AND existing ESS-patterns on the local, regional and national level. Such empirical information is required to decide on required/ideal trade-offs in terms of sustainable/secure food production. | Soil fertility as key indicator/target. | Learning from experiences from other regions and countries (see also "recommendations"). | The "Land sharing vs. land sparing" presentation by Lijbert Brussaard reflects many of the emerging research topics as perceived by this group. | Not discussed in detail, but in general:<br><br>Accessible state of the art (including grey literature).<br><br>Long-term research facilities. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Soil fertility as key indicator/target.<br><br>Old adapted cultivars as basis for breeding (improve resilience).<br><br>Integrated crop production (local level).<br><br>Optimisation of sustainable/adaptive agriculture requires input from a range of "traditional" fields of research like use of legumes, crop rotation, *mycorrhiza*, closure of protein gaps....<br><br>Research on agricultural production systems fully based on renewable energy/bio-based economy.<br><br>Applied research on ESS mapping methods as basis for assessing potential AND existing ESS-patterns on the local, regional and national level. Such empirical information is required to decide on required/ideal trade-offs in terms of sustainable/secure food production. | Knowledge hubs are a good idea in order to pool existing expertise and develop targeted projects avoiding overlapping across countries. This is specifically important for small countries. Small countries could therefore serve as triggers in the networking (strong interest and therefore ownership).<br><br>Interdisciplinary approaches required, also cross-sectorial approaches (agriculture & water management...).<br><br>Translation of existing knowledge for different levels of user (farmers, decision makers on the local/regional level) PLUS feedback mechanisms from users towards research and policies. | Interactive work of research and policy (like in the FACCE debate) should be further strengthened nationally and on the European scale.<br><br>Explicitly consider requirements of different user groups.<br><br>De-politicise the discussion: There should be a realistic perception what the current funding opportunities are under the given economic situation. |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**

**Group 5**

Participants:
*Anna-Kaarina Peura (FI)*
*Evelin Loit (EE)*
*Jan Staes (BE)*
*Anna Maria Marzetti (IT)*
*Thomas Rosswall (SAB)*
*Pablo Aller (moderator)*

| GROUP 5 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Foster interdisciplinary collaboration (propose structures, not wrap) as trade off and ESS are cross cutting disciplines. | | Streamline monitoring and data management systems (biodiversity, soils, etc) | | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| For similar agro-ecological regions across Europe, contribute to the national or regional ESS assessment by developing a common methodology which could be based on the approach of the MEA.<br><br>Provide proofs of concept/validation through case studies with farmer and policy participation and integrated monitoring of ESS. | JPI to involve in IPBES. | To increase the research on social/cultural services of certain agricultural practices.<br><br>UNESCO Man-Biosphere programme. |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**

**Group 6**

Participants:
*Yoram Kapulnik (IL)*
*John Finn (IE)*
*Maria Keuschnigg (AT)*
*Susanne Hede (DK)*
*Margarita Ruíz (ES, co-moderator)*
*Paloma Melgarejo (moderator)*

| GROUP 6 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Empirical data & improved modelling of food & ESS under extreme events (financial and environmental extremes).<br><br>Adequate information at appropriate spatial scales for ESS mapping – appropriate to farm-scale decision-making?? | | Networks to examine extreme events and use variety of conditions of EU to simulate some extreme events. | Methodologies to quantify synergies between Biodiversity& ESS. | |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Foresight analysis including risk assessment of current agro-ecosystems, and scenarios of alternative agro-ecosystems.<br><br>Decision-making support systems for farming extension services which help target appropriate farm-scale actions to enhance synergies and reduce trade-offs. | International networks of field sites & field experiments to generate extreme events and understand their effects on food and ESS, and trade-offs.<br><br>Improved sharing of national-scale databases (e.g. agricultural, meteorological, habitats etc.)<br><br>Awareness-raising among farmers about the role and benefits of ESS on their type of farming system. | Improved clarification & sharing of definitions/terminology & concepts associated with CT3 issues.<br><br>Improved awareness and decision-making by policymakers and funding agencies about linkages between food and ESS.<br><br>Regionalisation of international policies is important; especially for addressing trade-offs – local issues require local issues. |

**OUTCOMES OF THE BREAK-OUT SESSION ON DAY 2**

**Group 7**

Participants:
*Nastasia Belc (RO)*
*Knut Anders Hovstad (NO)*
*Martin Köchy (DE)*
*Jean-François Sousanna (SAB)*
*Domingo Iglesias (ES, co-moderator)*
*María José Delgado (moderator).*

| GROUP 7 - To identify | | | | |
|---|---|---|---|---|
| Gaps | Overlaps - Complementarities | Synergies | Emerging research topics | Research facilities |
| Policy issues, incl. climate change.<br><br>Integration across forestry, agriculture, economy.<br><br>Scaling up to landscape, country. | Different approaches to similar issues. | National gene banks.<br><br>Water/drought impacts on agriculture/ESS (synergy with other ERA NETs). | Systems approach.<br><br>Not more but smarter production.<br><br>Multi-functionality of land use. | Gene banks, open for research and industry. |

| Recommendations | | |
|---|---|---|
| Research topics for joint actions | Tools to undertake cooperation | Other suggestions |
| Relationship with CAP.<br><br>Local adaptation of farming systems to climate.<br><br>Ecological monitoring in “standard” landscape.<br><br>Impacts of farming systems/technology on soil C storage.<br><br>Function of diversity — diversity of functions.<br><br>Spatial sampling protocols of ecological monitoring to feed into ecological models. | Transfer of knowledge.<br><br>EU-wide gene bank facility.<br><br>Networking.<br><br>Ecological observatories.<br><br>Common monitoring programs. | Improve training strategies.<br><br>Effects of food consumption on regional ESS. |

## Annex 4. List of FP7 projects related to trade-offs (2007-2012 calls)

| Project | Project cost € millions | End date | Partners & countries |
|---|---|---|---|
| EUPHOROS - Efficient use of inputs in protected horticulture | 3 928 318 | 31/10/2012 | NL, IT, ES, HU, UK, LV, CH |
| NUE-CROPS - Improving nutrient efficiency in major European food, feed and biofuel crops to reduce the negative environmental impact of crop production | 9 597 833 | 30/4/2014 | UK, NL, DK, DE, BG, TR, CH, US, CN |
| N-TOOLBOX - Toolbox of cost-effective strategies for reductions in N losses to water | 1 472 517 | 30/09/2012 | UK, NL, ES, DK |
| FUNCiTree - Functional Diversity: an ecological framework for sustainable and adaptable agroforestry systems in landscape of semi-arid and arid eco-regions | 3 811 000 | 30/04/2013 | NO, ES, FR, NL, SN, ML, CR |
| VALORAM - Valorising Andean microbial diversity through sustainable intensification of potato-based farming systems | 3 854 973 | 31/01/2014 | BE, IE, AT, DE, PE, BO, EC |
| SIRRIMED - Sustainable use of irrigation water in the Mediterranean region (Irrigation) | 4 300 085 | 31/12/2013 | ES, NL, IT, GR, FR, UK, MA, LB, EG |
| CA2AFRICA - Conservation Agriculture in Africa: Analysing and foreseeing its impact - Comprehending its adoption | 1 159 228 | 31/12/2012 | FR, ES, DE, NL, MA, SY, CO, KE, MX |
| EAU4Food - European Union and African Union cooperative research to increase food production in irrigated farming systems in Africa | 4 943 245 | 30/06/2015 | NL, FR, UK, ES, MA, LK, ET, ZA, ZB |
| LEGUME-FUTURES- Key multifunctional legume crops | 4 095 015 | 28/02/2014 | UK, PL, NL, IE, GR, FR, DE, IT, SE, FI, ES, RO, DK |
| MULTISWARD - Multifunctional grasslands for sustainable ruminant production systems | 4 030 775 | 28/02/2014 | FR, BE, CH, NO, UK, PL, IT, FR, DE, NL |
| SOLIBAM - Breeding and management under low-input conditions and organic systems | 7 820 955 | 31/08/2014 | FR, UK, ES, IT, SY, DK, HU, PO, AT, DE, CH; MA, ET |
| OPTICHINA - Breeding to optimise Chinese agriculture | 575 535 | 31/05/2014 | ES, UK, DE, CN |
| SmartSOIL - Sustainable farm management aimed at reducing threats to soils under climate change | 3 748 927 | 31/10/2015 | DK, DE, UK, ES, NL, IT, PL, BE, HU |
| CATCH-C - Compatibility of agricultural management practices and types of farming in the EU to enhance climate change mitigation and soil health | 3 656 270 | 31/12/2014 | NL, DE, ES, IT, AT, PL, BE, NL, FR |
| REFERTIL - Improvement of comprehensive bio-waste transformation and nutrient recovery treatment processes for production of combined natural products | 4 150 926 | 30/09/2015 | HU, NL, PL, DE, DK, IT, ES, UK, IE, SL |
| FERTIPLUS - Reducing mineral fertilisers and agro-chemicals by recycling treated organic waste as compost and bio-char products | 4 035 827 | 30/11/2015 | NL, ES, UK, DE, IT, BE |
| OSCAR - Development of cover crop and mulch systems": Just started, no website yet | 3 909 282 | 31/03/2016 | DE, IT, UK, PL, BR, DK, SE, CH, NL, NO, MA, SY |
| INNOVINE - Combining innovation in vineyard management and genetic diversity for a sustainable European viticulture | NOT YET STARTED | | |
| FIGARO - Flexible and precise irrigation platform to Improve farm scale water productivity | NOT YET STARTED | | |
| BIOFECTOR - Resource Preservation by Application of bio-effectors in European Crop Production | NOT YET STARTED | | |
| LIBERATION - Linking farmland biodiversity to ecosystem services for effective eco-functional intensification | NOT YET STARTED | | |
| QUESSA - Quantification of ecological services for sustainable agriculture | NOT YET STARTED | | |

## Annex 5. List of documents from FACCE-JPI Mapping and Foresight on Assessing and reducing trade-offs: food production, biodiversity and Ecosystem services, available on the Intranet

A. **Summary of Conclusions and Recommendations**_FACCE JPI Mapping Meeting on Core Theme 3: Assessing and reducing tradeoffs: food production, biodiversity & ecosystems services.

B. **Final Report**_FACCE JPI Mapping Meeting on Core Theme 3: Assessing and reducing tradeoffs: food production, biodiversity & ecosystems services. Dublin, 11th -12th July.

C. **Presentations**

1. Introduction on the theme of the meeting '*Assessing and reducing trade-offs: food production, biodiversity & ecosystems services'*_Frits MOHREN (SAB)
2. Mappings by BIODIVERSA ERA-NET_Xavier LE ROUX (BiodivERsA)
3. Introduction to FACCE JPI_Isabelle ALBOUY (JPI FACCE CSA coordinator)
4. Role and objectives of Mapping Meeting_Nuria DURÁN (FACCE CSA WP2 Team)
5. JPI @ ESOF. Announcements_Rogier SCHULTE (Teagasc)
6. Scientific scenario's for addressing trade-offs_Lijbert BRUSSAARD (Wageningen UR)
7. How the FACCE JPI Knowledge Hub MACSUR will take trade-offs into account_Martin KOECHY (executive coordinator MACSUR, University of Braunschweig)

**D. Posters**

| | | |
|---|---|---|
| Austria | Funding Poster | Science Poster |
| Belgium | Funding Poster | Science Poster |
| Switzerland | Funding Poster | Science Poster |
| Cyprus | Funding Poster | Science Poster |
| Denmark | Funding Poster | Science Poster |
| Estonia | Funding Poster | Science Poster |
| Finland | Funding Poster | Science Poster |
| France | Funding Poster | Science Poster |
| Germany | Funding Poster | Science Poster |
| Ireland | Funding Poster | Science Poster |
| Israel | Funding Poster | Science Poster |
| Italy | Funding Poster | Science Poster |
| The Netherlands | Funding Poster | Science Poster |
| Norway | Funding Poster | Science Poster |
| Romania | Funding Poster | Science Poster |
| Spain | Funding Poster | Science Poster |
| United Kingdom | Funding Poster | Science Poster |
| European Commission | Science Posters on Trade-off research funded by FP7 | |