An FP7 ERA-NET on Sustainable Food Production and Consumption

Final Report – Publishable summary and dissemination activities

V7

Contents

1. Executive summary

SUSFOOD is the acronym for SUStainable FOOD production and consumption. Sustainability has been understood in a global context, with food systems challenged by increasing demand for safer and nutritious food and being affordable for all, in a context of increased pressure on natural resources (land, water, energy) and of climate change. SUSFOOD has covered the whole food chain with a main focus on sustainability beyond the farm gate, which is a unique scope across all ERA-NETs and JPIs.. This encompassed several thematic domains related to valorization of food and food products, engineering of the food production chain, and consumer preferences and behaviour, covering the successive steps from processing, packaging, transport, retailing, food services, storage and consumer activities.

The consortium of the ERA-NET has gathered 25 Partners from 16 European countries, with the support of three associated Partners involved in funding some of the activities, and the guidance of an external advisory group made of representatives of various stakeholders (including food industry) and other initiatives.

The main products of the project have been:

- Constructing an overview of existing research, by means of an open web based archive named the Meta Knowledge Base (MKB) hosting postings on research projects and publications and having allowed to publish and update a Country report
- Developing a transnational Strategic Research Agenda (SRA), based on the identified challenges for sustainability of food production and consumption, highlighting the proposal of eight priority research areas after discussion with nationals and international audiences
- Launching two transnational Calls for Research (R) or Research and Innovation (R/I), based on this SRA, with a first Call on “resource efficiency; innovation in food processing technologies and products; consumer behaviour” (9 projects funded, 2013) and a second Call on “innovation; resource efficiency; use of raw materials” (6 projects funded, 2014).

Beyond these concrete results, SUSFOOD lead to a better definition of sustainability issues along the value chains and of the contribution of pluridisciplinary research in this area. Thanks to the involvement of Partners, associated Partners, and various stakeholders, the present network sees perspectives for future activities, using the SRA and MKB tool developed during the time course of the initial ERA-NET.

2. Summary description of the project context and the main objectives

Context

According to the "Europe 2020 strategy", the vision for the European Union is to achieve a sustainable future, to ensure more jobs and better lives. Some of the key elements for this future are sustainability, innovation, economic growth and competitiveness, high employment rate and societal and territorial cohesion. The grand challenges that Europe is facing require sustainable solutions in areas such as :1) Food security to ensure enough food for the world´s growing population, 2) Sustainable food production to address the tightening supplies of energy, water, natural resources and climate change 3) Food and health to improve and secure quality of life of an ageing society.

Sustainability across the whole food chain is not addressed by any other ERA-NET nor by any Joint Programming Initiative. There is an urgent need for a coordinated chain approach and SUSFOOD was established in this purpose.

The scope of SUSFOOD encompasses the entire food supply chain with main focus on sustainability beyond the farm gate, taking into account the production methods up to the farm gate developed by other initiatives. SUSFOOD covers processing, packaging, transport, retailing, food services, storage and consumer activities including eating patterns. It promotes a multi-disciplinary approach, and knowledge exchange from biology to food engineering, and social sciences.

Overall goal

The goal of the ERA-NET SUSFOOD was to reinforce the scientific cooperation between EU member and associated states in order to maximise the contribution of research to the development of more sustainable food systems:

- Responding to the increasing demand for food to be met by increasing production sustainably and reducing losses and waste
- Mitigating the impact on the environment
- Combating obesity, malnutrition, and under-nutrition
- Reducing inequalities between rich and poor individuals and populations
- Improving competitiveness and economic growth in the European food industry, with special attention to SMEs.

Sub-goals

A central issue for the ERA-NET has been to define precisely what sustainability represents in the food area, in order to identify critical points across a wide range of activities throughout the food supply chain. SUSFOOD has come up with a definition of sustainable food systems as supporting food security, making optimal use of natural and human resources and respecting biodiversity and ecosystems for present and future generations, being culturally acceptable and accessible, environmentally sound and economically

fair and viable, and providing the consumer with nutritionally adequate, safe, healthy and affordable food.

To achieve its objectives, the consortium was to develop a strategy in three points:

- Constructing an overview of the existing research and resources
- Developing a transnational Strategic Research Agenda (SRA)
- Launching transnational Calls for proposals

as well as a communication strategy and a dissemination strategy (the latter being developed in the Conclusion).

To ensure adequate feed-back on its progress and output, SUSFOOD created an External Advisory Group (EAG). The EAG was invited to meet once a year and to give input to the SRA building. It gathered stakeholders ranging from public European funded initiatives to industrial and non-governmental actors of the food chain:

- **NGOs**: consumer (BEUC), environment (BEE)
- **ERA-NETS** : exchanges with the PLATFORM ERA-NET (ARD, Safe-food era, ETB Pro, Core Organic, Ruragri, Fisheries, ICT Agri)
- **JPIs** FACCE, Healthy Diet for a Healthy Life (HDHL), Oceans
- **ETP** food for life (key-trust « sustainable & ethical food production »), Plants for the future, TP Organic
- **FP7 Projects**: FAHRE, FUSION, Food Manufuture, SENSE, INPROFOOD
- **Experts** from SCAR (not members of SUSFOOD), KBBE net and JRC-IHCP
- **Industries** (Food and Drink Europe, Eurocommerce)
- **EUREKA/Euro Agri Food Chain**
- **Research associations** (Food Force, EuropaBio, Marine Stewardship Council)
- **IDDRI** (Institute for Sustainable Development and International Relations)
- **JRCs** (IRMM Institute for Reference Materials and Measurements)

Creation of an open web based archive to map research (Meta Knowledge Base, MKB) comprising resources, organisations and relevant projects

To create this database, the SUSFOOD scope, the MKB classification system and the MKB functionalities have been defined by the SUSFOOD Partners *via* workshops and questionnaires. After a short testing period by the SUSFOOD Partners, the MKB online database was publically launched in September 2012.

In this database, more than 800 researchers from more than 1000 organisations in Europe, 2000 scientific publications and 500 research projects were registered in November 2014. Data on funding bodies, national programmes and research organizations was posted by SUSFOOD Partners. A publically available Country Report based on the latter has been issued in March 2013 and updated twice; it was printed for dissemination in December 2013 and an online version with the latest data was made in November 2014.

The SUSFOOD Meta Knowledge Base (MKB) can be accessed at http://susfood-db-era.net.

Building a transnational Strategic Research Agenda

Through workshops, questionnaires and two rounds of national consultations, a close and active cooperation between SUSFOOD Partners, accompanied by interactions with representatives of other initiatives or institutions participating to the External Advisory Group, has allowed to produce a report on research needs (November 2012) and a Strategic Research Agenda (draft in May 2013, final version in January 2014, updated October 2014), as well as proposals for topics for the two transnational Calls (launched in February 2013 and January 2014).

SUSFOOD also consulted the EAG during the SRA building process for proposing recommendations for good practices. This has ensured a strong ownership of the SRA.

Launching transnational Calls for proposals

SUSFOOD has completed two Calls for proposals based on virtual common pots of a total of 17.6 Million euros from 15 funding countries. The Call Secretariat and the Call group are retained until the end of the projects

The first Call for transnational projects was based on a 10 million € funding by 19 funding organizations from 15 countries. The second one was of 7.3 M€ by 14 funding countries. They covered i) Innovation in food processing technologies; ii) Redesign input, waste and side flow strategies to increase resource efficiency and provide added value in food processing, manufacture etc.; iii) Interdisciplinary research approach to innovative food products and use of new raw materials for food product; and iv) Understanding consumer behaviour to encourage sustainable food choice. The Calls addressed research projects as well as public-private innovation projects. It attracted 135 applications and funded 15 projects including six Research & Innovation ones.

SUSFOOD also consulted the applicants and funders of both Calls in order to reflect upon the Call process and to propose improvements for forthcoming Call procedures.

Communication strategy

Other achievements pertain to communication and dissemination for the ERA-NET. A website was created (https://www.susfood-era.net/), a logo, a leaflet, a brochure, a poster and a kakemono were created and updated and four newsletters published. A partnering meeting was jointly organised by Ecotrofood, Food Manufuture and SUSFOOD in December 2013. It was a success thanks to the number of stakeholders who attended the event (78 people) but also thanks the strong involvement of the participants. The SUSFOOD final conference was organized in October 2014 for presenting the main activities performed during the three years to European researchers and stakeholders. The most attractive session was the presentation of the nine running projects supported in the framework of the first Call of proposals.

Future perspectives

One main activity of the SUSFOOD consortium in 2014 was to agree on a common strategy and to disseminate in a coordinated way the SUSFOOD strategy at the national and European levels. By maintaining the networking after the administrative end of SUSFOOD and promoting the SUSFOOD priority research areas, the consortium aims at maximizing the possibility to have

these topics appear in the Work Programme of H2020 and to apply successfully to the related Call.
The SUSFOOD network will be maintained: 19 SUSFOOD Partners out of the 21 ones answering the internal survey about the SUSFOOD future were in favour of maintaining the network. The main reasons for this are the fact that SUSFOOD's scope is unique within the ERA-NETs and bridges between the two Joint Programming Initiatives FACCE (Food Security, Agriculture and Climate Change) and HDHL (a Healthy Diet for a Healthy Life) under Horizon 2020. Furthermore the network within SUSFOOD is well established and useful. The MKB database is a very useful instrument that must be kept updated and easy accessible. The MBK will be retained until 2017 for supporting the future network. The Call Group and the Call secretariat will be retained until the end of the last projects, *i.e.* 2018.

The national consultations in the 16 SUSFOOD countries, from institutions and stakeholders along the food chain, showed that there is a common will from the SUSFOOD Countries to mutualize efforts for promoting the SUSFOOD research priorities.

The SUSFOOD first Call for proposals was so successful that it could fund only 10% of the submitted projects, which shows how high is the potential of the SUSFOOD thematic area. The 15 projects funded by the SUDFOOD Calls are far from exhausting the four priority research areas –out of eight- of the SUSFOOD SRA they refer to. The four other priority research areas are not covered at all by the SUSFOOD 1st and 2nd Calls.

The main objectives of the future SUSFOOD network will thus be organizing new Calls, possibly through a COFUND instrument.

3. Description of the main results

SUSFOOD has developed a strategy in three points:

- Constructing an overview of the existing research and resources
- Developing a transnational Strategic Research Agenda (SRA)
- Launching transnational Calls for proposals to expand the structuring impact of the network

as well as a communication strategy and a dissemination strategy.

Constructing an overview of the existing research: WP1

Maximum 11200 characters, spaces included

The first step towards the mapping tasks of WP1 was initiated at a workshop in 2012, where the SUSFOOD scope was outlined into three domains divided into several subdomains and a cross-cutting issue section. Also the functionalities of the online database and the classification system including the keywords were chosen and complemented by all SUSFOOD Partners *via* several questionnaires.
To map European sustainable food research, SUSFOOD launched an open web based archive (Meta Knowledge Base or MKB) in September 2012. This MKB offered a freely accessible database, an open forum and a partnering tool to the whole research community.

The philosophy behind the Meta Knowledge Base: the creation of a practical tool for many ERA-NETs

Mapping of the relevant research area has been a standard task in most ERA-NETs. The purpose is to establish an overview of the state-of-art in the research area. At this point it was recognised that the ERA-NET's requirements for searching knowledge is based on day-to-day activities of researchers (bibliography analysis). In combination with the obvious difficulty for the ERA-NET Partners to identify the relevant knowledge, the similarities with requirements in R&D community lead to the basic philosophy of the Meta Knowledge Base - for users by users.
The intention was to fill the database with short descriptions of knowledge about a given subject, which often could be a review of several R&D projects, accompanied with links and references to the original sources of information. Hence the name Meta Knowledge Base (MKB).
This MKB formed the basis for the mapping analysis about the research landscape and structure in the European Partner countries. This database was also intended to become a forum for the exchange of information between Member States and candidate countries for the EU and also for launching transnational Calls and joint trans-national Calls with other relevant activities such as other ERA-NETs.

The SUSFOOD Meta Knowledge Base: a mapping tool

Since the beginning, SUSFOOD chose to build further on the successful foundation of the ICT-AGRI MKB. At this time, the MKB had generated considerable interests from other ERA-NETs. It was therefore decided to develop a transferable and modifiable MKB template, which can be implemented in other ERA-NETs and similar projects and modified to meet the needs of the individual project. Therefore the SUSFOOD Partners chose to use the open-source Content Management System Drupal™ as a foundation. Drupal is a popular open source content management platform powering millions of websites and applications. By using Drupal, the MKB is secured concerning maintenance and further development.
The SUSFOOD MKB has been developed as a central internet-based resource for multiple purposes, including:

- Registration of professionals involved in an aspect of food science, with emphasis on sustainable food production and consumption beyond the farm gate all the way to the consumer. (in November 2014, 815 registered users are listed in the MKB)
- Profiles of organisations and professionals via an easy to use "Country page"
- Search facilities via keywords or specific research areas for identifying organisations, professionals and ongoing projects. In November 2014, 526 research projects and 2000 papers are listed in the MKB
- Closed rooms for user groups including partner search, e.g. for preparation of collaboration and applications for projects

However, the MKB is made so it can also be used for much more, namely as the project website, with many other features.

The SUSFOOD MKB mapping outcome

2 Country Reports

The MKB listed in November 2014 over 815 researchers and stakeholders and more than 1015 organisations from the Partner countries and beyond (21 countries are involved)! These data (funding bodies, relevant research programmes, research institutions, and other stakeholders) were published and printed in book format in December 2013 as a first Country Report, which was handed out towards representatives of other EU initiatives, national and international policy makers and research communities, and other relevant stakeholders. An updated version of this Country Report is electronically available in the current state of the MKB content by the end of November 2014 at http://susfood-db-era.net.

These figures highlight the success of the MKB and therefore it was decided that such a well filled database should continue after the administrative end of SUSFOOD and should be further developed and maintained. Therefore, the MKB was further improved to support the research community even more in their search towards Partners for international Calls.

Analysis of the projects

The second mapping analysis in the SUSFOOD project is performed to gather information about research projects from the research community. However, the cooperation of researchers is crucial, and often it was difficult to convince them to spend time on submitting their research to the database.

In November 2014, a total of 526 research projects were recorded in the MKB, which may be a good start of a new database. Most of those were submitted in the framework of the collection of data for the Country Report and the two research Calls. In most countries, postings were submitted by SUSFOOD Partners. Due to several reasons (e.g. no open publication databases, no specific research programmes, confidentiality, motivation of the researchers), there is a large difference in the amount of postings submitted between different countries. Most projects belonged to the research domains 1 (Valorisation of food and food products) and 2 (Engineering the food production chain for resource efficiency) ***(Figures 1 & 2).***

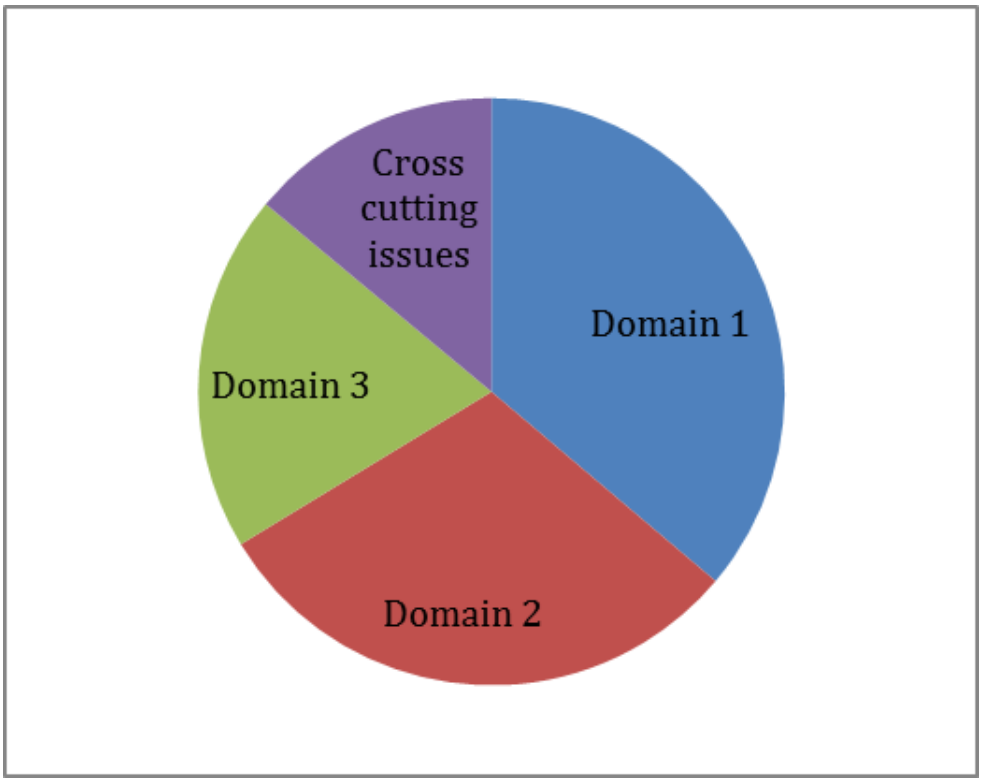


Figure 1: Distribution of the postings according to the domains. Domain 1 : Valorisation of food and food products – added value, Domain 2 : Engineering of the food production chain/system, Domain 3 : Consumer and sustainability, Domain 4 : cross-cutting issues.

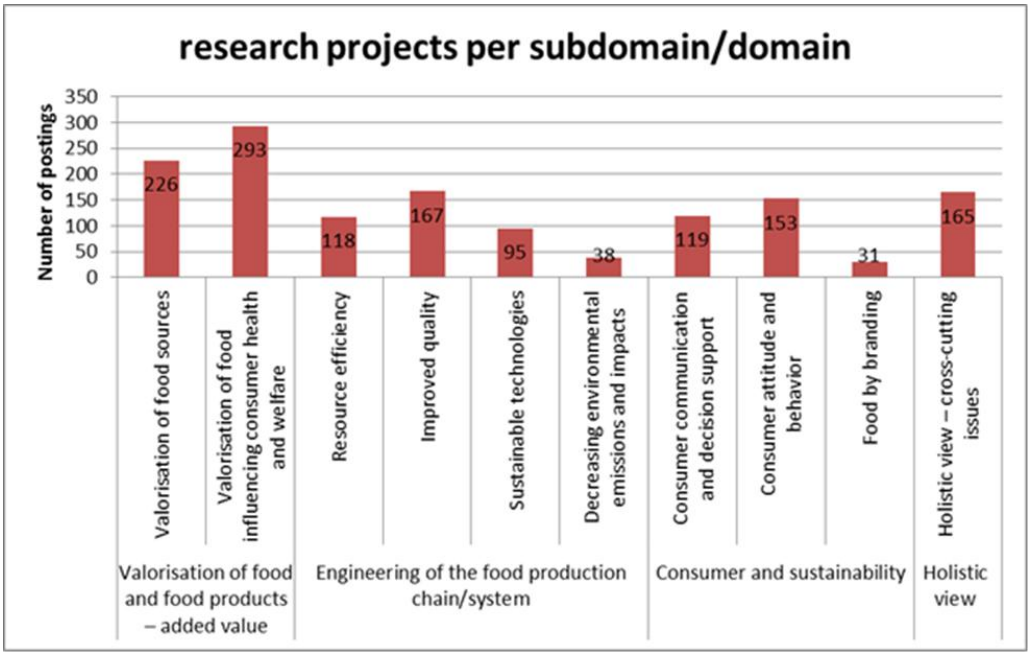
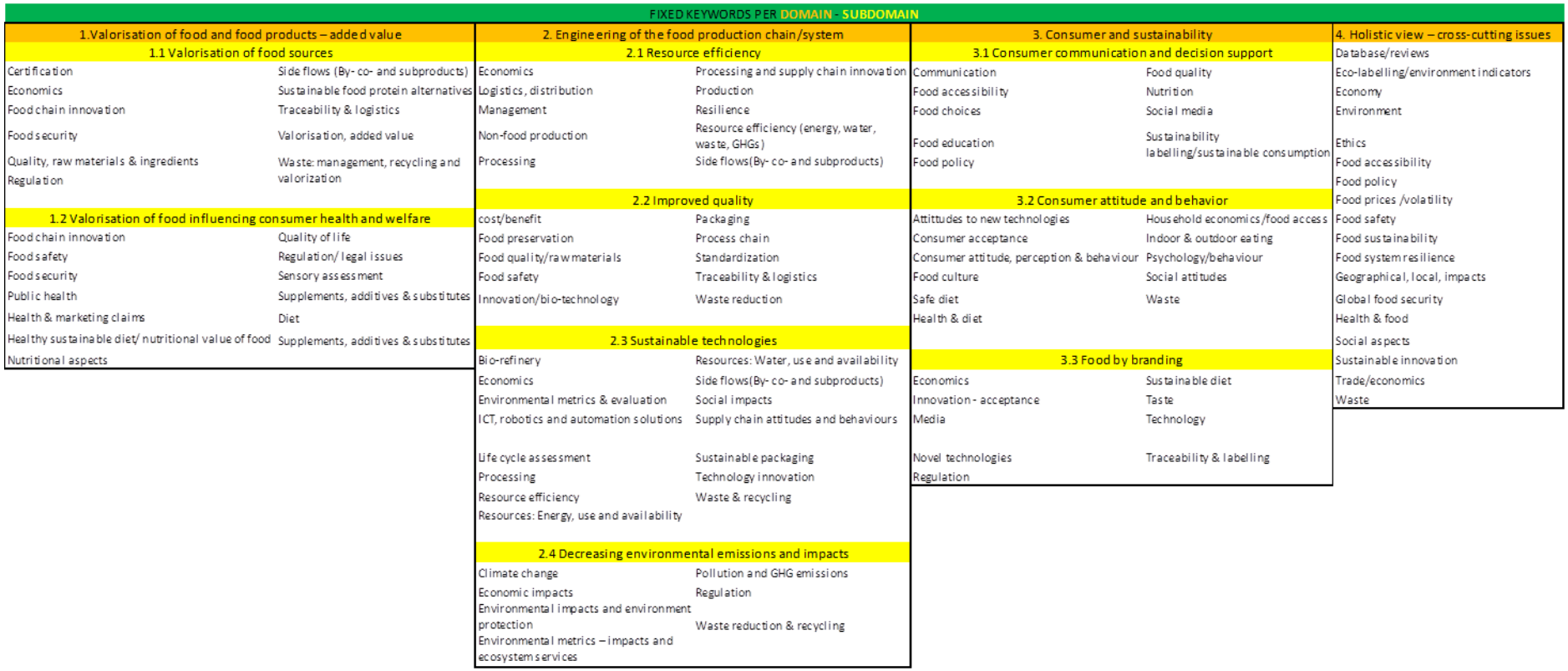


Figure 2: Number of relevant projects per domain (1) and subdomain (2)

The top 3 of the most used keywords consists of keywords concerning "nutritional aspects of food", "quality/raw materials" and "food safety". ***Figure 3*** below shows the key-word scheme available to the users.



FIXED KEYWORDS PER DOMAIN - SUBDOMAIN

1.Valorisation of food and food products – added value

1.1 Valorisation of food sources

Certification	Side flows (By- co- and subproducts)
Economics	Sustainable food protein alternatives
Food chain innovation	Traceability & logistics
Food security	Valorisation, added value
Quality, raw materials & ingredients	Waste: management, recycling and valorization
Regulation	

1.2 Valorisation of food influencing consumer health and welfare

Food chain innovation	Quality of life
Food safety	Regulation/ legal issues
Food security	Sensory assessment
Public health	Supplements, additives & substitutes
Health & marketing claims	Diet
Healthy sustainable diet/ nutritional value of food	Supplements, additives & substitutes
Nutritional aspects	

2. Engineering of the food production chain/system

2.1 Resource efficiency

Economics	Processing and supply chain innovation
Logistics, distribution	Production
Management	Resilience
Non-food production	Resource efficiency (energy, water, waste, GHGs)
Processing	Side flows(By- co- and subproducts)

2.2 Improved quality

cost/benefit	Packaging
Food preservation	Process chain
Food quality/raw materials	Standardization
Food safety	Traceability & logistics
Innovation/bio-technology	Waste reduction

2.3 Sustainable technologies

Bio-refinery	Resources: Water, use and availability
Economics	Side flows(By- co- and subproducts)
Environmental metrics & evaluation	Social impacts
ICT, robotics and automation solutions	Supply chain attitudes and behaviours
Life cycle assessment	Sustainable packaging
Processing	Technology innovation
Resource efficiency	Waste & recycling
Resources: Energy, use and availability	

2.4 Decreasing environmental emissions and impacts

Climate change	Pollution and GHG emissions
Economic impacts	Regulation
Environmental impacts and environment protection	Waste reduction & recycling
Environmental metrics – impacts and ecosystem services	

3. Consumer and sustainability

3.1 Consumer communication and decision support

Communication	Food quality
Food accessibility	Nutrition
Food choices	Social media
Food education	Sustainability labelling/sustainable consumption
Food policy	

3.2 Consumer attitude and behavior

Attittudes to new technologies	Household economics/food access
Consumer acceptance	Indoor & outdoor eating
Consumer attitude, perception & behaviour	Psychology/behaviour
Food culture	Social attitudes
Safe diet	Waste
Health & diet	

3.3 Food by branding

Economics	Sustainable diet
Innovation - acceptance	Taste
Media	Technology
Novel technologies	Traceability & labelling
Regulation	

4. Holistic view – cross-cutting issues

Database/reviews
Eco-labelling/environment indicators
Economy
Environment
Ethics
Food accessibility
Food policy
Food prices /volatility
Food safety
Food sustainability
Food system resilience
Geographical, local, impacts
Global food security
Health & food
Social aspects
Sustainable innovation
Trade/economics
Waste

Figure 3: Keyword scheme SUSFOOD

The MKB: an online database for users-by-users– How to be found and how to find ?

The aim of the SUSFOOD MKB was to become the most appropriate medium to answer each of these three questions, in order to serve all kinds of stakeholders:

- On what kind of projects are European food researchers working on?
- How can I find suitable partners in research and industry?
- How can I find the suitable funding body for my projects?

To create an online database useful for all kind of stakeholders, a suitable classification system had to be created. The classification systems' main purpose was to ensure that a relevant research project would be found by a search. A good classification system is very useful to allow different ways of searching for a given subject. When performing a search, irrelevant search hits can easily be filtered out from the description of the research project. Today, searches can be performed into the MKB on registered users expertise, organisations, and projects submitted.

The use of the MKB was measured via Google Analytics from May 2014 until November 2014. It showed that the MKB is frequently used (2725 visitors and 8822 views) and consist of 15,7 % returning users. Surprising, was the information we gained on how users enter MKB website and what they visited. Results show that 67% of all users enter to a certain page of the MKB via an organic search (e.g. Google). Especially organisations and projects are found this way.

The MKB: a communication platform

One year after its launch, the SUSFOOD MKB was updated with a new layout and some new features to better serve researchers using the database; the most important are:

- The Country pages, displaying all organisations (both research and funding) with expertise, contact data and registered users in each SUSFOOD country
- A partnering tool, which was made available for facilitating consortium-building and preparation of international projects.

The SUSFOOD MKB helps researchers communicate their expertise and research to colleagues and stakeholders internationally and serves as an online information/data center about topics concerning sustainability and food.

The MKB future

The information about organisations and national programmes is performing and will be maintained.

The motivation among researchers and developers has not resulted in very high submission of entries to the MKB. The researchers recognise the values of such a tool as statistics show that the database is relatively intensely used for data gathering. But they have not all taken the time to describe and submit their own knowledge. Such data entry might be seen as an additional request for providing information that steals time from the real work of researchers.

This lower-than-expected participation in the MKB may be viewed as a sign. Other ERA-NETs using other methodologies for mapping had experienced similar success rates. Therefore, improved ways should be developed to provide even more gains to researchers and other stakeholders to intensively use and submit into the MKB and to ensure a self-sustainable continuously updated database.

From the introduction online of the database to intense use of it by researchers, more than two years are needed. Hence the time frame within SUSFOOD duration was too tight. In addition, as from 2016 more food oriented research Calls are expected into

H2020, the MKB is now promoted as a partnering tool. Therefore, the MKB will stay online and is secured until 2017 and improvements are still ongoing.
Following new developments are ongoing in the near future:

- Simplifying the keyword-choice procedure
- Making the interface about printing/exporting more user-friendly
- Merging the partnering tools of SUSFOOD, ICT-AGRI and COFASP (after administrative end of SUSFOOD)

The developments within Open Data Repositories are crucial and will be explored in the future. A first step will be to try to interconnect the Drupal based ERA-NET MKBs (COFASP, ICT-AGRI 2, ERA CAPS) and perform searches for registered users, organisations *etc.* in all databases simultaneously.
New funding opportunities for further development and the implementation of innovative ideas for the MKB to serve the stakeholders better will be looked at: *e.g.* to build up periodically repeated surveys on what has been raised up in a certain research field. Today, it is only possible to survey published research, but it would be much more useful if it was possible to survey just started research. Many other ideas (clustering, applications of Bayes network model *etc.*) that could pilot the MKB among researchers but also between researchers and enterprises should be investigated. As soon as researchers would realise that they really save a lot of time with linking to the SUSFOOD MKB, the interest would likely remain and possible increase. And even more, it could improve collaboration between research and enterprises and speed up innovation.
In brief, the SUSFOOD MKB continues:

- As communication tool for the SUSFOOD future
- As communication platform among food scientists
- As partnering tool for the scientific community
- As data center in sustainable food science

Developing a transnational Strategic Research Agenda (SRA): WP2

More than 500 hard copies (booklets) of the SRA and even more in electronic version have been disseminated. The SRA has been presented and discussed at various national and international audiences, workshops and conferences. The participants have included representatives from government institutions, researchers, politicians, broadcasting institutions and others.

The SRA document can be found on https://www.susfood-era.net/lw_resource/datapool/_items/item_177/sra-final_website.pdf

Priority research areas

Based on the challenges for sustainable food production and consumption SUSFOOD has identified eight priority research areas where new knowledge will have an impact on sustainable food production and consumption across industry, society etc.; each research area comprises a short rationale and examples of important research areas. These eight research areas are valuable on their own; however research in each area may impact on the other research areas ***(see figure 4),*** e.g. new food processing technology may result in a need for research in redesign of input and vice versa. All research should always be considered in respect to the SUSFOOD definition of sustainability, the focus for SUSFOOD and to the two cross-cutting issues described below.

The eight priority research areas are as follows.
(The order of the Research Areas in the list does not reflect any order of priority)

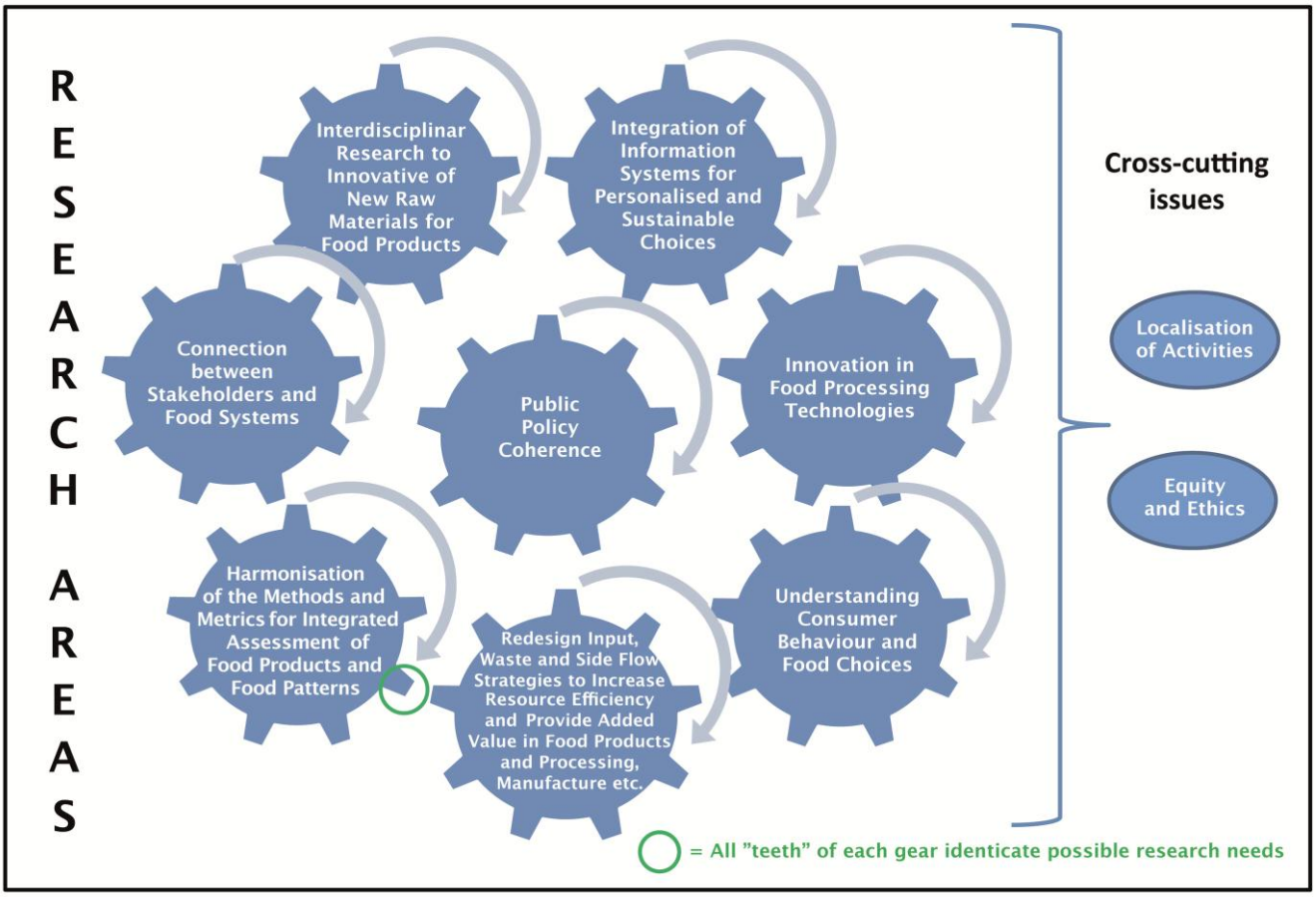


Figure 4. The SUSFOOD gearbox. The eight research areas and the two cross-cutting issues (CI) identified by SUSFOOD. The eight research areas have their own value, however each may affect one or more of the other areas (symbolized with arrows) and should be thought in the context of the CI's. For each research area a number of examples are described, symbolized by teeth. Results of each research needs may have consequences for other research needs

1. Public policy coherence

In order to achieve sustainable food systems, public policies need to be coherent and transparent throughout the system. Thus, there is a need to review and develop policies throughout the food chain, including primary production and how this inter-relates with other policies that impact on food production. Policies may also affect consumption differently in different social groups, and there is a need to understand the impact policies have on various consumer segments, e.g. in terms of differences in affordability, accessibility, and cultural accessibility. System governance has to be connected to critical points in food system operation and to policy perspectives. Developing a better understanding of issues or levers of action concerning EU competition policy in the food sector is of importance.

Sustainability may be achieved by using a "full costing" covering the whole supply chain from the field to the dinner table.

This research area includes

- Understanding where there are tensions/coherence within the present policies to achieve sustainable production and consumption, including consequences impacts of policies targeted at the primary sector (at farm level), for the secondary sector (beyond the farm gate) and consumption
- Understanding how policy levers can overcome barriers and tensions, what the consequences are for the production and for the consumption at various social levels of "full-costing policies", of innovation and investment policies, and of labelling/food safety/food standards
- Understanding trade-offs/tensions between policies supporting sustainability; e.g. price policies versus nutrition policies, promotion of development of plant protein versus animal protein, promotion of bio-fuel production versus food production, impact on lower income people
- Understanding how to balance between regulation and incentives (including subsidy/taxation of certain food items) to achieve a sustainable food production or/and consumption. Conditions for a legitimate public policy
- Understanding and developing how to integrate sustainability and nutritional recommendations

Expected outcome:

Insight on the extent to which policies and regulations may impede sustainable production and consumption. Identification of opportunities, levers and interventions to support development of coherent policies on sustainability. This insight will provide tools for all stakeholders to review and renew policies supporting sustainable food production and consumption.

2. Innovation in food processing technologies

There is a need for flexible, innovative food manufacturing, and resilient processes and systems. Opportunities must be identified to increase competitiveness, efficiency, and economic growth in a low-carbon European food and drink sector. Research needs to support innovative solutions to achieve sustainably produced food, through more efficient food processing,

packaging and distribution embracing the retail and catering sectors and to produce food which is safe, healthy, sensorial, affordable, and nutritionally balanced. This will require development of new technologies or improvement of existing technologies to retain and improve the nutritional qualities of the raw materials through gentle or changed processing methods. Flexible and resilient processes and systems are needed to overcome the increased variability of raw materials in the future (due to agro-ecology, climate change and extreme climate events, global trade, and other factors), and optimize resource efficiency through reduced energy, water use and improve environmental impact through reducing greenhouse gases. New processes are needed to upgrade and valorize components from alternative sources to food grade ingredients based on functional directed isolation of food components from complex plant-, algae- or animal-based matrices (included aquatic) to ensure optimal use of raw materials.

This research area includes

- Development of separation technologies; new extraction, filtration and heat treatment or alternatives to heat treatment technologies consuming less material, water and energy
- Use of minimal processing, less specialised processes and alternative technologies to fractioning
- Development of processes based on fermentation technologies or enzyme technology
- Development of engineering solutions and process/systems automation for increasing efficiency and flexibility in food processing, packaging, manufacturing, and distribution
- Improvement of the match between processing technologies and raw materials availability and quality to maximise exploitation and functionality and to reduce waste
- Development of flexible technologies and systems to optimize use of increasing raw material variability in quality, location and price
- Development of novel packaging concepts, materials and designs which promote re-use or recycling, minimise the overall environmental impact of food and are consistent with functionality
- Development of smart technologies for single process operations
- Food process design, including supportive modelling of food processes, develop ICT-based management systems, process control/optimization, systems for control and monitoring, including on/in-line rapid analyses based on advanced sensors, rapid data acquisition and multivariate data handling (Process Analytical Technologies – PAT)

Expected outcome:

More resource-efficient and innovative food processing technologies for food processing and manufacturing that address sustainability.

3. Redesign input, waste and side flow strategies to increase resource efficiency and provide added value in food products and processing, manufacture etc.

The food supply chain is complex and at all stages resources are used, greenhouse gases are emitted and waste is generated. Rising prices of raw materials, energy and water, together with water scarcity, regulation of greenhouse gases and waste management have an increasing impact on food production.

In order to achieve more sustainable and resilient food production – including prolonging shelf life without compromising food safety, nutritional and sensorial characteristics – there is a strong need for research supporting redesign of the supply chain and the whole production chain from raw material to consumption, to create the most efficient production, valorise products and side streams, optimize use of raw materials, ingredients, energy and water, and changes of packaging materials. The redesign should accommodate demanded food qualities including food safety, organoleptic and nutritional quality. The research may include impact assessment, including economic aspects of reduced (food) waste.

This research area includes

- Valorisation of raw materials, waste and side streams based on a zero-waste philosophy upgrading to more healthy foods, use of processing side streams that are normally not used for foods and valorisation of waste into food ingredients, fine chemicals or feed. Specific areas of interest are production chain re-engineering, bio-refinery and bioprocessing including use of enzymes and fermentation to add value to side streams and waste
- Based on analysing critical points in the food chain, development of new sustainable food manufacturing processes and technologies to reduce water and energy input. Specific focus areas include hygienic design of food processes and equipment (food safety), development of technologies to reduce energy consumption (including more efficient cooling and freezing processes and storage) and improving product quality (including food safety, nutrition, organoleptic), development of packaging and surface materials, and coatings for process equipment
- Modelling and simulating redesigned processes and food chain (through multi-model integration)
- Supply chain management, energy, water and environment in connection with future production systems, including distribution services, waste management, recycling, and choice of packaging materials
- Development of new materials and new polymer compounds for novel packaging of food

Expected outcome:

More efficient use of raw materials, resources, processing techniques and waste reduction for maintaining or improving microbiological, chemical, organoleptic and nutritional food quality.

4. Interdisciplinary research approach to innovative food products and use of new raw materials for food products

There is a need for research in the use of new raw materials for production of ingredients or foods based on side streams or by-products, which are important sources for a sustainable food production. To ensure affordable, safe and locally accepted foods that fulfil nutritional requirements for various consumer segments, there is a need to identify new ingredients from by-products, new and/or underexploited species, and whole crop harvesting systems. Likewise, there is a need for development of new ingredients with high nutrient density, taking into account the bioavailability of the nutrients. Development of new gentle methods to fractionate raw materials and isolate

the compounds in focus without reducing their functional properties is essential for obtaining the right quality ingredients. There is a strong need to develop tools and protocols for registration of new types of raw materials as well as novel food products, and legislation has to be simplified.

This research area includes

- Functionalization of new and underexploited raw materials, including development of plant-based, insect, algae or other sea product alternatives to conventional animal protein products, using new and traditional raw materials
- Understanding the effects of various processing methods on the quality of the raw material. Identification of novel and innovative attributes in raw materials
- Reformulation and preservation of food products in response to consumer demands through processes with lower environmental impact
- Increased and secured nutritional and safety quality of foods and bioactive substances by understanding food microbiology and toxicology
- Development of infrastructures supporting negotiation with regulatory authorities in the EU and on export markets for approval of novel foods and food chains

Expected outcome:

Increased and broadened raw materials used for food production and consumption optimizing quantity and quality (nutritional, microbiological, chemical and organoleptic), and reducing waste, including addressing related technological and administrative impediments.

5. Harmonisation of the methods and metrics for integrated assessment of sustainability of food products and food patterns

For stakeholders to be able to assess and value the sustainability of food products in a chain perspective there is need to develop harmonised and transparent methods and metrics to measure, monitor and assess sustainability of food production and consumption. The methods and metrics will be aligned and include primary production, as this will affect the end product.

The methods and metrics will comprise nutritional, environmental, social and economic impacts. Measuring sustainability of consumption and eating patterns will be included. Harmonisation of methods will make it possible to quantify relevant parameters for sustainability and underpin food security, traceability and alerting, and risk management.

Policies to improve the sustainability of the global food chain must be evidence led, based on transparency and open data sharing. Policy makers, industries and other stakeholders should be able to access the right data for research and be able to communicate the trade-offs between the dimensions of sustainability (economic, social and environmental), and derive knowledge for use in practice.

The development of models will be based on collected data, e.g. in a public European database, of extensive measurements of the sustainability of products and tests of measuring methods. This will eventually be transferred

into modelling of food systems at various scales and simulation of alternative food systems. Use of indicators is part of the theme. The establishment, maintenance and running cost of this modelling should be considered. A trustworthy system will ensure European competiveness on the international market.

This research area includes

- Development of new methodologies to quantify sustainability parameters
- Identification of relevant data, including predictive data, and environmental, nutritional, social and economic critical points for various food items/products from raw material to consumption
- Identification of measuring methods and developing of models
- Coherence. Understanding trade-offs between the different dimensions of sustainability
- Analyses on how new data collection and models interact with national systems and legal aspects
- Development of traceability methods for the supply chain
- Development of cheaper and less complex analytical methods as tools for rapid screening of food quality from the safety and nutritional point of view
- Modelling of food systems at various scales and simulation of alternative food systems

Expected outcome:

Tools for assessing the sustainability attributes of various food products and food systems, including transparency of the critical points and how this relates to private strategies, national systems and legal aspects.

6. Connection between stakeholders and food systems

There is a need for a multi-stakeholder approach to redesign and optimize food systems for more sustainable food production that meets consumer demand. Sustainable production and consumption of food i.e. with reduced impact on the environment and climate will be most successful when all the food chain actors (i.e. the food industry, government, distributers and consumers) work together to encourage, produce and consume a healthy, nutritious, affordable and sustainable diet and avoid food spoilage at each step of the food chain.

Collaborative networks and tools are necessary in order to transfer the knowledge from research into practice and for stakeholders to use it. Improvement of the distribution chain by development of new models of organisation and management, marketing and new distribution channels and networks could be important factors to achieve sustainability.

Development of the linkages between stakeholders will be challenged by trust, transparency, confidence and competitiveness. Changes in behaviours and perceptions throughout the food chain are needed to achieve sustainability. Such changes may include changed structures and improved and/or increased share of information, however stakeholders need to perceive more advantages than disadvantages to do so. Changes in the food system towards more sustainability may change power relations, which needs to be taken into

account. To support establishment of new linkages and new structures demands understanding the present structures and motives.

This research area includes

- Analyses of various stakeholders´ (policy makers, producers, manufactures, distributors, and consumers) perceptions of sustainability, identifying the tensions, barriers, synergies and opportunities to encourage sustainability
- Understanding society's engagement in food production and how to increase it. Factors may include behaviours, business drivers and socio-economic factors impacting on the food chain and business environment
- Understanding how the supply chain influences agricultural production and reacts to public policies, and how this can be used in a positive way
- Understanding how the supply chain addresses the needs of the low-income populations for affordable sustainable products
- Gathering evidence to support impact assessments including how various food chains and food waste affects sustainability and food prices
- Understanding how relationships between stakeholders can be developed including identification of critical points, how to overcome these, and at which cost/benefit
- Understanding how different organizational structures in the food chain can increase the resilience of food systems towards crises, extreme events, price volatility
- Socio-economic analysis for understanding how to develop markets for ecosystems services and ecosystem-based models for the supply chain
- Development of new models, structures, and business platforms including the development of online tools to approach entrepreneurs, technologists, and inventors
- Creation of new market, of organizational and management structures, and of distribution channels and networks

Expected outcome:

Knowledge of various stakeholders' perception of sustainability and insight into challenges and opportunities to achieve sustainable and resilient food systems, including new market opportunities.

7. Understanding consumer behaviour and food choices

To facilitate sustainable consumer behaviour, insight is needed into the factors that determine consumer behaviours and choices. This involves studies of what drives consumer purchasing practises, priorities (cultural, sensorial), preparation methods, storage and discarding of food items made by the consumers.

This research area encompasses socio-economic, cross-cultural and individual barriers and drivers to adopting healthy and sustainable diets. Relevant factors are consumer attitudes and relationships as well as the role of formal and informal education, social learning, commercials, discounts, nudging, etc. The change in demography and acceptance of new technology to support sustainable production and consumption is expected to impact on food choices.

Changes may take place based on improved knowledge, affordability, prioritisation of use of resources based on attitude, including cultural factors, knowledge, accessibility, and the interaction of these factors. In addition to improved knowledge of how products appeal to the customer, changes in consumer attitudes, expectations and behaviour requires improved knowledge on how to increase the populations´ motivations factors for choosing sustainable foods.

There is a mutual interaction between changes in consumer choices and changes in the range of products supplied to consumers, including how the food availability has an impact on the behaviour and choices of the consumer.

Change in diets for a larger group of consumers will have repercussions on social and economic aspects in the food sector.

This research area includes

- Identification of consumer trust in/perception of/acceptance of/expectations and demands to sustainability and sustainable products and marketing of such products. This may include length of food chain
- Identification of consumer barriers and drivers for changing behaviour with respect to purchasing, storage, waste, preparation, purchasing and eating innovative sustainable food, acceptance and use of new technologies, and the consequence of this, as well as how to overcome the barriers (single or combined factors/information). The research should address economic (e.g. at national/household level), social (e.g. cultural), environmental nutritional and food safety impacts
- Understanding how to quantify the impact of large-scale diet changes
- Identification of behaviour change levers to promote uptake of healthy affordable food
- Understanding and developing tools for how healthy, nutritious and safe diets can be achieved as part of increased sustainable food production
- Understanding consumer attitudes to change of food habits in respect to sustainable consumption e.g. partial change from animal to vegetal protein intake and other new products, and if there are any trade-offs when adapting to healthy and sustainable diets and how to overcome consumer barriers
- Understanding consumer views, conceptions of and reactions towards labelling sustainability (combining factors such as food spoilage, food quality and food waste), and how to change consumer views towards a positive development
- Understanding behavioural opportunities for achieving sustainability in the home (cooking, optimal resource management, waste management, and how households) can have a positive impact on the sustainability of foods systems. Impact on policies and redesign of products for optimal home use
- Understanding drivers, including marketing, for consumer food choice and what affects supply chain behaviour to help encourage more sustainable practices
- Understanding consumer acceptance of new technologies to increase sustainable production and consumption

Expected outcome:
Insight into how sustainability choices can become the preferable choice for the consumer.

8. Integration of information systems for personalized and sustainable choices

Based on existing information systems, research is needed to identify which type of information and in which mode of expression information has an impact on consumer behaviour inside and outside the home, why and how it has an effect on sustainability, safety and nutrition. There is a need to target specific groups of the population (elderly, young people) and various socio-economic categories. There is a need for, at the individual level, better understanding of assessments of food safety/organoleptic/nutritional quality/waste (shelf life). In addition, consumers may have a need for understanding and trust in new food production methods, particularly with increased urbanization.

This research area includes

- Developing methods and technologies improving transparency of what is sustainable within food systems for consumers and stakeholders
- Developing smart labelling of the sustainability of food and diets meeting the need of the consumers including e.g. chips and other IT solutions
- Understanding level of transparency and type and combination of information tools (databases, media, policies) affecting various types of consumer groups, and how this effects the consumers
- Understanding the impact of ICT technologies (smartphones and social media) and how combination of technologies affects changes in individuals' choices
- Development of ICT technologies to change individual consumer choices

Expected outcome:
Enabling consumers to purchase and prepare sustainable food.

Cross-cutting Issues

SUSFOOD has identified cross-cutting challenges which need to be addressed as an integral part of the priority research areas:

Equity and ethics

With reference to human rights, all research related to sustainable production and consumption needs to take food access and availability, infrastructure, and information and communication technologies into account. The vulnerability of a larger number of people and the increasing inequality between and inside countries imply that the access for all consumers, including lower-income people, to sustainable food should be addressed as a priority.

Localisation of food chain activities

Research related to sustainable food production and consumption should be clear on I) the determinants of the localisation of the different activities at

different geographical levels, II) how trends impact on re-localisation of activities, and III) the consequences of the re-localisation on the whole system.

This includes the possible effect of/how localisation (production, manufacturing and consumption) affect actors in the food chain towards sustainable production and consumption (expanding "fair-trade" thinking to domestic products).

Launching transnational Calls for proposals to expand the structuring impact of the network: WP3

The main task of WP 3 was the organization of two transnational Calls for proposals.

The first Call

The first Call of SUSFOOD was launched in February 2013. 19 funding organisations and 15 countries participated in the Call and offered a budget of 10 million € for the three selected topics:

1. Improving input, waste and side flow strategies to increase resource efficiency and provide added value in food products and food processing, manufacture, reducing input (energy, water etc.) in the food chain.
2. Innovation in food processing technologies and food products to support a sustainable food chain.
3. Understanding consumer behaviour to encourage a (more) sustainable food choice

The Call was divided in two sections. The section "Research" was only for research organizations, in the section "Research and Innovation" industry participation was expected.

The Call was very successful as 98 pre-proposals were submitted.

26 of them were invited to submit a Full Proposal. For the evaluation a Scientific Evaluation Committee was established. The involved experts evaluated the proposals and established a ranking list, which was the basis for the funding Partners to select the finally funded projects.

3 projects of every topic were selected, whereof 6 were from the Research and 3 from the Research and Innovation section ***(please see figure 5).***

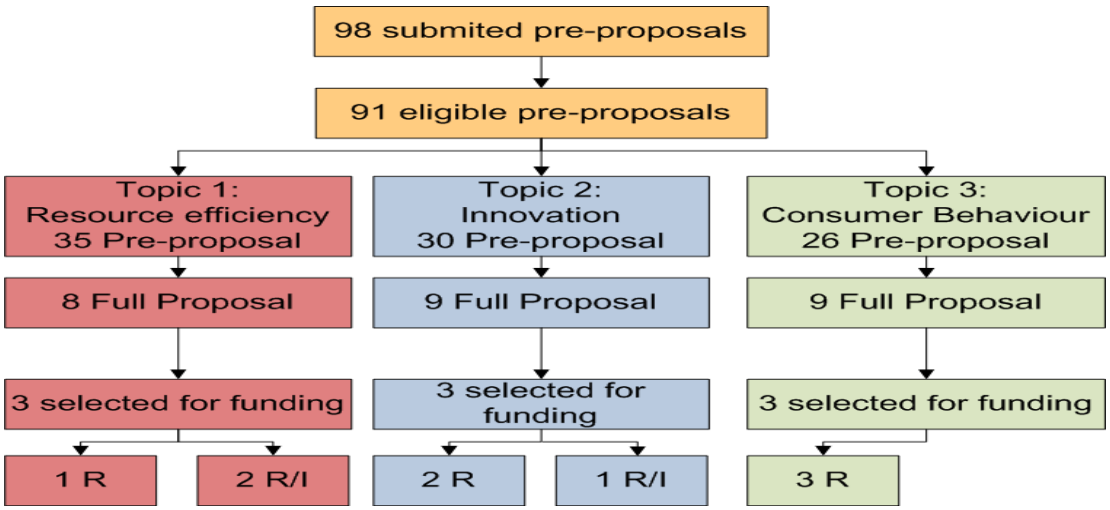


Figure 5: Overview of the proposals of all stages of the 1st SUSFOOD Call

The projects of topic 1(resource efficiency) are:

- **Sunniva** (R/I; Belgium, Spain, France, Italy, Norway, Poland; Turkey):
  - Sustainable food production through quality optimized raw material production and processing technologies for premium quality vegetable products and generated by-products
- **BioSuck** (R/I; Germany, Norway, Poland):
  - Decision support system on optimized waste collection by vacuum technology with simultaneous production of bioenergy from wastes
- **CEREAL** (R; Germany, Spain, Finland, Italy, Sweden):
  - Improving input, waste and side flow strategies to increase resource efficiency and provide added value in food products and food processing, manufacture, reducing input (energy, water etc.) in the food chain

The projects of topic 2 (innovation) are:

- **BIOPROT** (R; Finland, Italy, Turkey):
  - Novel multifunctional plant protein ingredients with bioprocessing
- **Sustainable&Healthy** (R; Germany, Poland, Sweden):
  - Innovation in food processing technologies and food products to support a sustainable food chain
- **CIBUS-Food** (R/I; Belgium, Germany, Netherlands):
  - Computational-design and Innovative Building of Uniquely Structured Food

The projects of topic 3 (consumer behavior) are:

- **FOCAS** (R; Germany, Denmark, Sweden, United Kingdom):
  - Food, Convenience and Sustainability
- **COSUS** (R; Germany, Denmark, Netherlands, Norway, Sweden):
  - Consumers in a sustainable food supply chain: understanding barriers and facilitators for acceptance of visually suboptimal foods
- **SUSDIET** (R; Germany, Spain, Finland, France, Italy, Norway, Sweden, United Kingdom):
  - Understanding consumer behaviour to encourage a (more) sustainable food choice

The second Call

The second Call of SUSFOOD was pre-announced in January 2014 to provide information to the applicants as early as possible and launched in February 2014. 15 funding organizations out of 14 countries participated in the second Call with an overall budget of 7.6 million Euro:

1. Innovation in food processing technologies
2. Redesign input, waste and side flow strategies to increase resource efficiency and provide added value in food processing, manufacture etc.
3. Interdisciplinary research approach to innovative food products and use of new raw materials for food products

The Call was again divided in the two sections "Research" and "Research and Innovation". 46 pre-proposals were submitted and 17 invited to submit a Full Proposal. 6 projects with 33 participants out of 11 countries (Denmark, Estonia, Finland, France, Germany, Romania, Spain, Sweden, UK, Latvia, New Zealand, the latter two countries participating on their own funds) were finally selected for funding. 3 of the projects were out of the research section and 3 with industry participation ***(please see figure 6).***

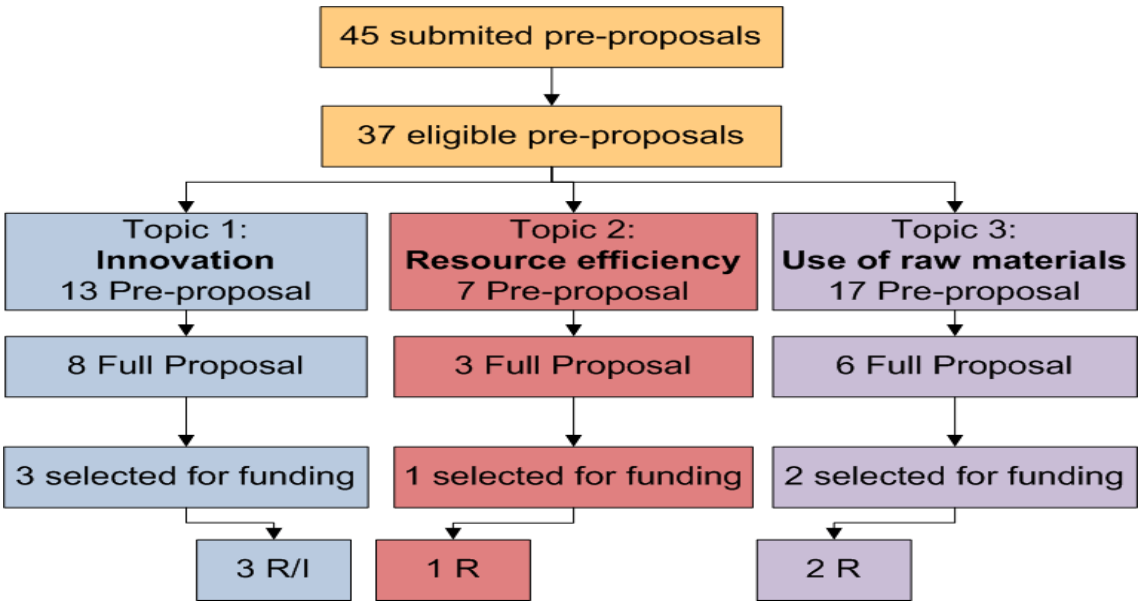


Figure 6: Overview of the proposals of all stages of the 2nd SUSFOOD Call

The projects of topic 1 (Innovation) are:

- **FREEZEWAVE** (R/I; France, Sweden, Germany)
  Innovative and low energy microwave assisted freezing process for high quality foods
- **RF Cooking of Ham** (R; Germany, Denmark, Spain)
  Short time high quality cooking of boiled ham using radio frequency electric fields
- **ProRef** (R/I; Germany, France, Spain)
  Gentle and resource-efficient refining of vegetable oils for preservation of valuable components and simplified reprocessing of by-products

The project of topic 2 (resource efficiency) is:

- **BERRYPOM** (R; Germany, United Kingdom, Spain, Sweden, New Zealand)
  Adding value to fruit processing waste: innovative ways to incorporate fibres from berry pomace in baked and extruded projects related to cereal foods

The projects of topic 3 (Use of raw materials) are:

- **SUSMEATPRO** (R; Sweden, Finland, Estonia, Denmark, Latvia):
  Sustainable plant ingredients for healthier meat products – proof of concepts
- **OATPRO** (R; Finland, Denmark, Germany, Romania):
  Engineering of oat proteins: Consumer driven sustainable food development process

Altogether the transnational Calls of SUSFOOD were very successful as the high number of more than 150 submitted pre-proposals showed. Out of these 15 projects, 9 of the research section 6 out of the Research & Innovation section, with 94 participants were selected for funding.

The 2013 projects have already started and the projects selected in 2014 will start their work in 2015. The Call Secretariat and the Call Group will be retained until the end of the projects to support and accompany the Consortia and the projects work progress.

Communicating: WP4

The main objective of WP4 was consisting in raising awareness about the SUSFOOD ERA-NET and its activities but also disseminating its main results. Based on a strong visual identity, communication and dissemination activities were targeting mainly researchers, policy makers and industry. Due to an important visit of the SUSFOOD website by a wide range of stakeholders in the field of sustainability, this tool has contributed widely to communicate about the project.

Website consultation

The SUSFOOD website is frequently visited – especially during the opening phases of the two Calls: in the beginning of 2013 (Pre-proposal phase 1st Call) and in the beginning of 2014 (Pre-proposal phase of the 2nd Call). In ***figure 7*** is also highlighted that – besides the two big peaks during the Pre-proposal phases – two smaller peaks are visible during the Full proposal phases in late summer/autumn 2013 and 2014.

Figure 7: Timeline-statistics: Visits of the SUSFOOD website from Oct 2012 until September 2014.

This highlights the most important function of the website: an information and submission tool for the applications during the Call phases.

This hypothesis is confirmed when regarding at the statistics in ***figures 8 and 9***. The subpages of the SUSFOOD website which are visited the most belong to the Calls (dark green) and the submission portal (light green).

Another interesting observation by comparing the two statistics in ***figures 8 and 9*** is that the information pages (in blue) have been visited much more during 2013 compared to 2014. One possible explanation for that effect may be that SUSFOOD has become more and more known in the community, so that the general pages which describe the ERA-NET are not interesting any more for many applicants/ stakeholders.

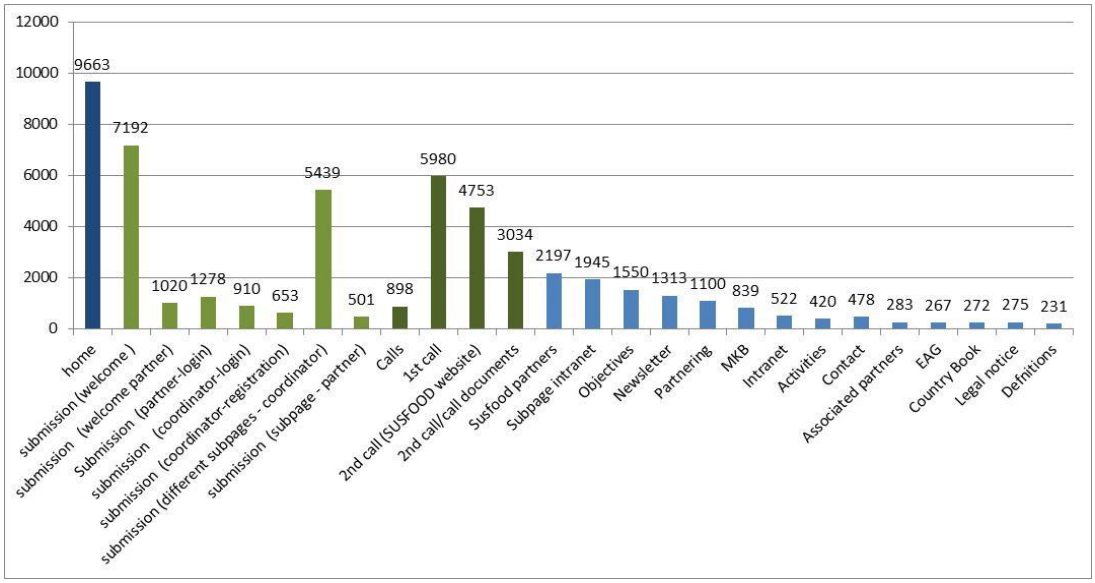


Figure 8: Overview of visited subpages of the SUSFOOD website: October 2013 - April 2014.

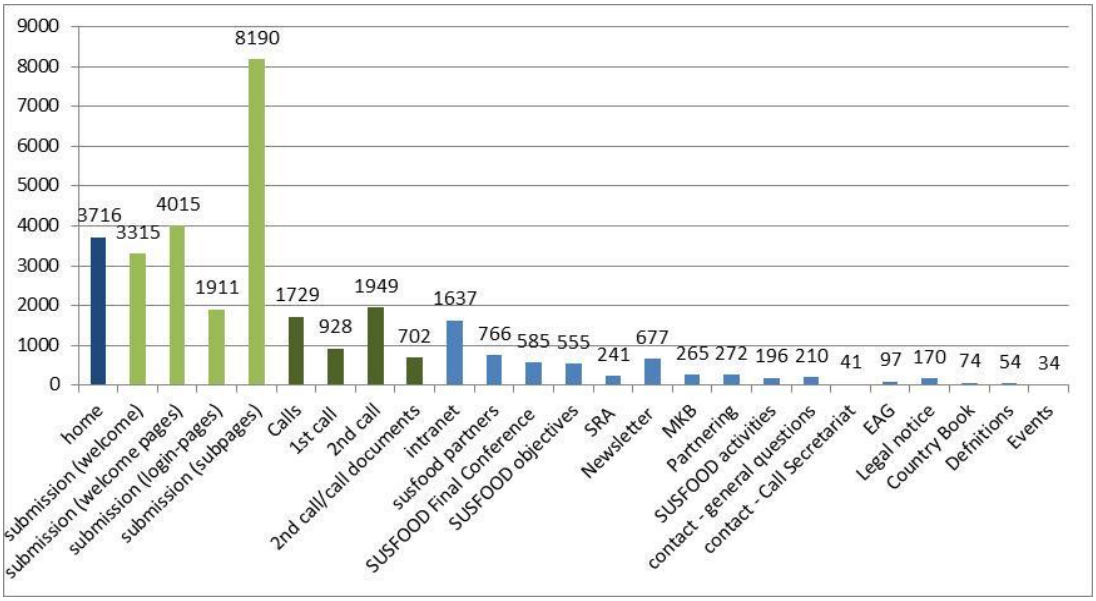


Figure 9: Overview of visited subpages of the SUSFOOD website: April 2014 – Sept. 2014.

Newsletters

During the runtime of the SUSFOOD ERA-NET, four newsletters were created and sent to a broad range of interested stakeholders. Whereas the first newsletter was designed and implemented manually, from the second newsletter on a newsletter tool has been established to create and send the newsletters in a semi-automatic way. This means that all texts and illustrations were entered manually. Afterwards the document was set-up and sent automatically to those addresses entered in the database.

Interested stakeholders had the possibility to subscribe themselves on the SUSFOOD website for the newsletter. Until November 2014, 915 email-addresses are subscribed in the database to receive the newsletters.

The archived newsletters are available on the website and can be downloaded at https://www.susfood-era.net/index.php?index=23 .

Partnering meeting & final conference output in regard with dissemination

The partnering meeting ***(figures 10 and 11)*** aimed at gathering researchers and industrials interested in participating in the SUSFOOD second Call in order to help them identify ideas of proposals and also suitable partners for starting to build consortia to answer to the SUSFOOD second Call.

This meeting, held on the 17th of December 2013 in Brussels, was organised in combination with the EcoTroFood event "Eco-innovation in the European food sector" in order to attract a lot of participants working in the area of sustainability all over Europe.

A common brochure with EcoTroFood project, including texts written by the SUSFOOD WP leaders to explain SUSFOOD and its main results (presentation of the project, MKB & Country Report book, SRA, Calls for proposal, Partners), had been published and was not only available in pdf version but also printed and handed out to the participants.

Figure 10: Partnering meeting – 17/12/2013 – Brussels

Figure 11: Partnering meeting – 17/12/2013 – Brussels

The final conference ***(figures 12 and 13)*** has been organized on the 21st of October 2014 in combination with SIAL event, the largest food innovation observatory in the world, which was representing a very good point for attracting stakeholders, especially from the food industry.
The aim of this last conference was to create awareness of the SUSFOOD outcome, including the MKB, the SRA and the funded research. The agenda targeted mainly the presentation of the nine projects accepted during the first Call of proposals launched and managed in 2013.
This latter part of the agenda was very positively welcomed by all the attendees, giving them opportunities to develop new contacts for future potential projects in the field of sustainability. The presentations of the main activities that have been performed successfully in the project were also introduced by the tasks leaders during this event.
These two events contributed widely to the dissemination of SUSFOOD activities and results.

Figure 12: Final conference – 21/10/2014 – SIAL Parc des expositions Villepinte


Figure 13: Final conference – 21/10/2014 – SIAL Parc des expositions Villepinte

4. Potential impact (including the socio-economic impact and the wider societal implications of the project) and main dissemination activities

SUSFOOD has several major strengths for potential impact:

- Addressing the grand challenges with a multidisciplinary and holistic approach at the European level.
- Connecting national activities, increasing coherence, innovating on procedures and methods for joint actions, building a coordinated common SRA, influencing the international food research.
- Taking into account other initiatives: several ERA-NETs, the FACCE and the HDHL Joint programming Initiatives, the Food for Life ETP (supported by European food industry) and several other FP7 projects.

As an ERA-NET, SUSFOOD was aiming at increasing cooperation and synergy between the European Partners and at defining common future perspectives in sustainable food production and consumption. Thanks to the identification of research priorities, gaps and opportunities, and a study of future research needs, SUSFOOD has produced a Strategic Research Agenda and funded the research for 15 consortia, having positive impacts on European research and SMEs employment. The Strategic Research Agenda establishes a joint agenda for European food research when it comes to the sustainability issues (to be made available for H2020 and the JPIs FACCE and HDHL). By means of its two open Calls (in 2013 and 2014), sustainability oriented food chain projects has been supported, in order to allow the European research area to be in the lead in sustainable food production, supply and consumption.

With a wider perspective, by a very active dissemination of the SUSFOOD strategy by all Partners, SUSFOOD keeps on raising the awareness of the scientific community, of the food industry, and of policy makers and NGOs on the subject of sustainability along the food chain.

Social impacts expected by applying the SRA

SUSFOOD expects to have social impact through encouraging research:

In the field of public policy coherence

SUSFOOD promotes insight on the extent to which policies and regulations may impede sustainable production and consumption. Identifying opportunities, levers and interventions will support the development of coherent policies on sustainability and will provide tools for all stakeholders to review and renew policies supporting sustainable food production and consumption.

SUSFOOD expects such impacts by promoting the following research areas:

- Understanding trade-offs/tensions between policies supporting sustainability; e.g. price policies versus nutrition policies, promotion of development of plant protein versus animal protein, promotion of bio-fuel production versus food production, impact on lower income people
- Understanding how to balance between regulation and incentives (including subsidy/taxation of certain food items) to achieve a

sustainable food production or/and consumption. Conditions for a legitimate public policy

In the field of harmonisation of assessment methods along the food chain

SUSFOOD supports the development of tools for assessing the sustainability attributes of various food products and food systems, including transparency of the critical points and how this relates to private strategies, national systems and legal aspects.

SUSFOOD expects the above social impacts by promoting the following research areas:

- Development of new methodologies to quantify sustainability parameters
- Identification of relevant data, including predictive data, and environmental, nutritional, social and economic critical points for various food items/products from raw material to consumption
- Identification of measuring methods and developing of models
- Analyses on how new data collection and models interact with national systems and legal aspects

In the field of connection between stakeholders and food systems

The actors of the food chain and their levers of actions will play a major role in making the food sector evolve. SUSFOOD expects to support such social impact by promoting the following research topics:

- Analyses of various stakeholders´ (policy makers, producers, manufactures, distributors, and consumers) perceptions of sustainability, identifying the tensions, barriers, synergies and opportunities to encourage sustainability
- Understanding society's engagement in food production and how to increase it. Factors may include behaviours, business drivers and socio-economic factors impacting on the food chain and business environment
- Understanding how the supply chain addresses the needs of the low-income populations for affordable sustainable products
- Understanding how different organizational structures in the food chain can increase the resilience of food systems towards crises, extreme events, price volatility

In the field of consumer behaviour and personalized systems of information

The consumers, their eating patterns and their drivers of consumption, have a key-role in the sustainability of the food systems. SUSFOOD expect to have social impacts in this regard *via* the following actions:

- Identification of consumer trust in/perception of/acceptance of/expectations and demands to sustainability and sustainable products and marketing of such products. This may include length of food chain
- Identification of consumer barriers and drivers for changing behaviour with respect to purchasing, storage, waste, preparation, purchasing and eating innovative sustainable food, acceptance and use of new technologies, and the consequence of this, as well as how to overcome the barriers (single or combined factors/information). The research

should address economic (e.g. at national/household level), social (e.g. cultural), environmental nutritional and food safety impacts
- ❖ Understanding how to quantify the impact of large-scale diet changes
- ❖ Understanding consumer attitudes to change of food habits in respect to sustainable consumption e.g. partial change from animal to vegetal protein intake and other new products, and if there are any trade-offs when adapting to healthy and sustainable diets and how to overcome consumer barriers

In the field of equity and ethics

The vulnerability of a larger number of people and the increasing inequality between and inside countries imply that the access for all consumers, including lower-income people, to sustainable food should be addressed as a priority.

Economic impacts expected by applying the SRA

SUSFOOD expects to have economic impact through encouraging research:

In the field of industrial processing and valorisation of raw material

More resource-efficient and innovative food processing technologies for food processing and manufacturing that address sustainability will allow the following economic impacts:

- ❖ Development of engineering solutions and process/systems automation for increasing efficiency and flexibility in food processing, packaging, manufacturing, and distribution. Based on analysing critical points in the food chain, development of new sustainable food manufacturing processes and technologies to reduce water and energy input. Functionalization of new and underexploited raw materials, including development of plant-based, insect, algae or other sea product alternatives
- ❖ Improvement of the match between processing technologies and raw materials availability and quality to maximise exploitation and functionality and to reduce waste. Use of processing side streams that are normally not used for foods and valorisation of waste into food ingredients, fine chemicals or feed.
- ❖ Food process design, including supportive modelling of food processes, develop ICT-based management systems, process control/optimization, systems for control and monitoring, including on/in-line rapid analyses based on advanced sensors, rapid data acquisition and multivariate data handling
- ❖ Development of novel packaging concepts, materials and designs which promote re-use or recycling, minimise the overall environmental impact of food and are consistent with functionality

In the field of harmonisation of assessment methods along the food chain

SUSFOOD supports the development of tools for assessing the sustainability attributes of various food products and food systems, including transparency of the critical points and how this relates to private strategies, national systems and legal aspects.
SUSFOOD expects the above social impacts by promoting the following research areas:

- Development of traceability methods for the supply chain

In the field of connection between stakeholders and food systems

- Socio-economic analysis for understanding how to develop markets for ecosystems services and ecosystem-based models for the supply chain

In the field of consumer behaviour and personalized systems of information

- Understanding consumer views, conceptions of and reactions towards labelling sustainability (combining factors such as food spoilage, food quality and food waste), and how to change consumer views towards a positive development
- Developing smart labelling of the sustainability of food and diets meeting the need of the consumers including e.g. chips and other IT solutions
- Understanding the impact of ICT technologies (smartphones and social media) and how combination of technologies affects changes in individuals' choices

In the field of localisation of food chain activities

Research related to sustainable food production and consumption should be clear on I) the determinants of the localisation of the different activities at different geographical levels, II) how trends impact on re-localisation of activities, and III) the consequences of the re-localisation on the whole system. This includes the possible effect of/how localisation (production, manufacturing and consumption) affect actors in the food chain towards sustainable production and consumption (expanding "fair-trade" thinking to domestic products).

5. List of dissemination activities

The date "01/01/2014" was entered when the actual date was not recorded.

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
1	PowerPoint presentation	P1 INRA	SRA	24/06/2013	Brussel	Food for Life mirror group		France
2	National broadcasting (TV&Radio) interview	P8 DASTI	Strategy (including SRA)	20/03/2014		general public (society)		
3	National broadcasting (TV&Radio) interview	P13 UCPH	Strategy (including SRA)	20/03/2014		general public (society)		
4	PowerPoint presentation	P8 DASTI	Strategy (including SRA)	07/04/2014		National group Food Best		
5	PowerPoint presentation	P8 DASTI	SRA	19/05/2014		Food for Life mirror group		
6	PowerPoint presentation	P1 INRA	SRA	20/03/2014		Food*force*		
7	conference	INRA	SUSFOOD output and funde projetcs	21/10/2014		stakeholders		European countries
8	workshop	ACTIA	Partnering meting: networking	17/12/2013		stakeholders		European countries
9	workshop	BLE	Bridging European initiatives	18/09/2014		research community, EC		European countries
10	Oral presentation	P13 UCPH	SRA	19/05/2014		Commission		
11	Oral presentation	P13 UCPH	SRA	18/09/2014		ICT-agri/SUSFOOD workshop		
12	Oral presentation	INRA	SUSFOOD scope and output	18/09/2014	Bonn	Reserach community		European countries

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
13	Oral presentation	P13 UCPH	SRA	18/12/2013		ECOTROFOOD& FoodManuture Partnering meeting, Bruxelles		
14	Oral presentation	INRA	SUSFOOD scope, aim and output	17/12/2013	Brussels	stakeholders		European countries
15	Oral presentation	ILVO	SUSFOOD Meta Knowledge Base	17/12/2013	Brussels	stakeholders		European countries
16	Oral presentation	BLE	SUSFOOD Calls	17/12/2013	Brussels	stakeholders		European countries
17	Oral presentation	P13 UCPH	SRA	21/10/2014		SIAL Conference		
18	Oral presentation	INRA	SUSFOOD scope, aim, output and future	21/10/2014	Paris SIAL	stakeholders		European countries
19	Oral presentation	ILVO	SUSFOOD Meta Knowledge Base	21/01/2014	Paris SIAL	stakeholders		European countries
20	Oral presentation	BLE	SUSFOOD Calls	21/10/2014	Paris SIAL	stakeholders		European countries
21	Websites/applications	ILVO	SUSFOOD MKB	31/08/2012	http://susfood-db-era.net/	all		international countries
22	Oral presentation	INIA	SUSFOOD SRA	01/01/2014	workshop "nutrition and health in specific population groups"	researchers, scientists and private sector		
23	oral presentation	JUELICH	SUSFOOD SRA	01/01/2014	Bonn	funders and multipliers (national contact point of Life		Germany

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
						Science research association of German food industry)		
24	Oral presentation	MTT	SUSFOOD SRA	01/01/2014	Brussels, at meeting "junction group challenges on healh, environment and bioeconomy"	research policy		European countries
25	Oral presentation	MIPAAF	SUSFOOD SRA	01/01/2014	at workshop "the future of food"	stakeholders		European countries
26	Oral presentation	ELIKA	SUSFOOD SRA	01/01/2014	unknown	researchers	150	Basque country
27	email with electronic attachments	P1 INRA	Strategy (including SRA)	01/04/2014		National group Food Best		France
28	email with electronic attachments	P13 UCPH	Strategy (including SRA)	01/04/2014		4 Danish universities		enmark
29	email with electronic attachments	P8 DASTI	SRA	25/03/2014		EC-Bioeconomy panel		European countries
30	email with electronic attachments	P8 DASTI	Strategy (including SRA)	26/03/2014		EC-SCAR WG		European countries

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
31	email with electronic attachments	P8 DASTI	Strategy (including SRA)			EC-SCAR WG Commission Officer		European countries
32	email with electronic attachments	P8 DASTI	SRA	01/04/2014		national representatives at Programme Committee SC2		European countries
33	email with electronic attachments	P8 DASTI	SRA	01/04/2014		national stakeholders		Denmark
34	email with electronic attachments	P8 DASTI	SRA	01/04/2014		the Danish Council for Strategic Research		Denmark
35	email with electronic attachments	P1 INRA	Strategy (including SRA)	08/04/2014		EC-DG R&I, Directorate F Bioeconomy, John Bell		European countries
36	email with electronic attachments	P1 INRA	Strategy (including SRA)	20/03/2014		Food*force*		European countries
37	email with electronic attachments	P12 ILVO	Strategy (including SRA)	25/03/2014		national representatives at Programme Committee SC2		Belgium
38	booklet	P12 ILVO	SRA	25/02/2014		food research and industrial networks		European countries
39	booklet	P12 ILVO	SRA	25/02/2014		Flemish gouvernment		Belgium
40	email with electronic attachments	P12 ILVO	SRA	18/02/2014		national MKB stakeholders		Belgium

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
41	booklet	P12 ILVO	SRA	28/02/2014		Flemish and Wallon food research networks and funders		Belgium
42	booklet	P13 UCPH	SRA	01/03/2014		2 NGOs		Denmark
43	booklet	P13 UCPH	SRA	01/03/2014		5 industries		Denmark
44	Provided comments to H2020 doc.	P13 UCPH	SRA	Oct. 2014		Internal hearings for national institutions		Denmark
45	Booklets	P13 UCPH	SRA	Feb.2014		All SUSFOOD Partners		European countries
46	Booklets	P13 UCPH	SRA	Feb.2014		All External Advisory Group		European countries
47	email with electronic attachments	P13 UCPH	SRA	15/10/2014		All SUSFOOD Partners		European countries
48	SRA-slides on SUSFOOD intranet	P13 UCPH	SRA	10/04/2014		All SUSFOOD parthers		European countries
49	Via national consultations	P12 ILVO	SRA	11/06/2014		H2020 Workprogramm 2016-2017		European countries
50	stakeholders' consultation H2020	P12 ILVO	SRA + CR	24/06/2014		Societal challenges 2 (SC2 questionnaire WP 2016-2017)		European countries
51	booklet and digital version	P12 ILVO	SRA + CR	contineously and during national events eg veg-i-trade final conference (12/06/2014)		national and international research and industry		European countries

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
52	booklet and digital version	P12 ILVO	SRA + CR	via Flanders Food (eg. Kick-off platform duurzaamheid (19/06/2014)		policy and industry (mainly national)		European countries
53	Via all kinds of channels (flyers, mailing, …)	P12 ILVO	MKB	continuously		To research and industry		European countries
54	Leaflet	P12 ILVO	MKB	sept-14		JPI Management board		European countries
55	Leaflets	P12 ILVO	SUSFOOD	at any occasion		research, industry		European countries
56	Leaflets, poster	P12 ILVO	SUSFOOD and MKB	2012-2013: inprofood workshop, BSFM congres, Dag van de Agrologistiek (NI), Bamst workshop, presentation MIRA rapport, National dairy contactgroup		all kind		European countries
57	email with electronic attachments	P1 INRA	Strategy (including SRA)	19/03/2014		national representatives at Programme Committee SC2		France
58	email with electronic attachments	P1 INRA	Strategy (including SRA)	31/03/2014		EC Scientific Officer for SUSFOOD		European countries
59	booklet	P1 INRA	SRA	01/04/2014		4 INRA food related departments		France
60	booklet	P1 INRA	SRA	01/04/2014		national MKB		Belgium

NO	Type of activity	Main leader	title	Date	Place	type of audience	size of audience	countries addressed
						stakeholders (1: ANSES)		
61	booklet	P1 INRA	SRA	01/04/2014		national research institutes (17)		France

6. SUSFOOD website and MKB addresses and contact details

www.susfood-era.net and http://susfood-db-era.net/drupal/.

7. List of illustrations (to be put in Section "main results")