FOSC

ERA-NET Cofund on
Food Systems and Climate

FOSC 2019 joint call on Food Systems and Climate Funded Projects

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555





About FOSC

FOSC is the European Research Area Network (ERA-Net) Cofund action on Food Systems and Climate. FOSC is built upon and supported by the experience from FACCE-JPI and LEAP-Agri. The consortium consists of 28 partners from Europe, Africa and Latin America. FOSC pulls together resources for a joint research programme and is supported by the European Commission (EC) through an ERA-Net Cofund grant.

How to feed 10 billion people?

FOSC addresses one of our world's major challenges: How to feed 10 billion people by 2050. Ensuring food and nutrition security in the long-term while containing global warming within 1.5 or 2°C, will require major changes on a societal-level and a systemic transformation of our food systems. Important aspects to acknowledge in this are:

- current patterns of food consumption and production increase pressure on already scarce natural resources;
- climate change undermines food systems and reduces food security;
- environmental degradation puts additional pressure on food production;
- consumer behaviour patterns favour the predominantly short term vision of food systems; and
- availability of food is highly unequally distributed around the globe.

FOSC ambition

The ambition of FOSC is to implement a range of joint activities to contribute to the creation of a strong and effective trans-national research and innovation network between Europe, Africa, and Latin America. FOSC aims as well to contribute to the coordination and synergism between national and international research programmes that are relevant to food security under climate change.

The challenge of achieving food and nutrition security within the context of sustainable food systems calls for increased investment and collaboration. It is aspired that the partnership will increase investments in R&D&I through a coordinated regional mechanism aimed at reducing fragmentation.

Activities of FOSC

FOSC initiates and organises additional activities to foster collaborations and enhance impact of research on food systems and climate in Europe and beyond:

- the preparation and implementation of a joint call for proposals (FOSC call 2019);
- the deployment of innovative instruments for alignment and collaboration in R&D&I;
- a second call or alternative research funding activity (2021 joint call with SUSFOOD2);
- capacity strengthening;
- stakeholder engagement;
- support to policy making;
- infrastructure development;
- organize trainings for researchers; and
- communication and dissemination of results emerging from activities.

LEAP-Agri

FACCEJPI

FOSC 2019 call

The first major activity of FOSC is was the organisation of a trans-continental call in the field of food systems and climate. Aim of the call: to support scientifically excellent, trans-continental R&D&I projects that contribute to the knowledge base on food systems and climate change. The call had a funding budget of approximately 16 million euros, including the EC-cofunding. The call was launched in 2019 and used a two-step procedure. 17 Projects were selected for funding.

Key information

The joint call supports basic and applied research and is focused on the interactions between climate and food systems: assessing the consequences of climate change on agri-food markets and developing sustainable and resilient food value chains in the context of changing food need and patterns (diets).

The projects of the FOSC call are multidisciplinary and/or transdisciplinary and address the following topics:

- assess climate change-related risks for food value chains, including impacts on producers, prices, availability, quality, international trade and food security, and resulting changes in consumer behaviours;
- promote innovative technology deployment to build sustainable and resilient food value chains influenced by changing food needs and patterns, and to develop better efficiency of the inputs and outputs of food systems;
- improve resilience and reduce volatility in agri-food production and food markets to sustainably improve food security in the context of climatic variation; and
- reduce food losses under climate change, including novel approaches to valorise side streams and reduce food waste.

Consortia consist of teams from a minimum of 4 countries from 2 continents, with at least 2 European countries and 2 countries from Africa and/or Latin America. The projects have a maximum duration of 3 years and start in June-September 2021.

FOSC has the ambition to address both spatial scales and time scales with the funded projects.
Spatial scales: local analysis for case studies at landscape and farm scales and projections at the regional level. This includes comparisons between different regions (and projects) as well as global analyses.

Time scales: the 2050 time-horizon is selected and transitions between current conditions and 2050 are studied considering relevant scenarios integrating multiple drivers, including climate trends and climatic variability with special attention to risks caused by extreme weather events and demographic evolution.

Expected impacts

Expected impacts from the outcomes of the FOSC 2019 co-funded call are:

- support of the transition to carbon neutral agriculture and food chains;
- increased understanding of the effects of climate change on global food value chains; and
- development of solutions posed by environmental changes to the food system.

Evaluation and outcomes

FOSC received 71 pre-proposals. From this, 43 consortia have been invited to submit a full proposal. Full proposals were evaluated and ranked by experts. The funding bodies followed the ranking list and 17 projects were selected for funding.

Participation of countries

A total of 26 funding agencies from 22 countries from 3 continents allocated national or regional research budget to support this call (co-funded by the EC). This resulted in a total funding of approximately 16 million euros (including EC cofund contribution) and the selection of 17 projects. Additionally, in some projects researchers participate on their own budgets.

Number of projects by country

Algeria, 5 projects
Belgium, 3 projects
Burkina Faso, 1 project
Egypt, 5 projects
France, 6 projects
Germany, 9 projects
Honduras, 1 project
Hungary, 1 project
Ireland, 1 project
Italy, 5 projects
Ivory Coast, 1 project
Kenya, 9 projects
Morocco, 7 projects
Norway, 4 projects
Panama, 0 projects
Senegal, 3 projects
South Africa, 9 projects
Sweden, 3 projects
The Netherlands, 5 projects
Turkey, 3 projects
United Kingdom, 3 projects

Researchers participating on their own funds:
Brazil, 2 projects
Japan, 1 project
Mexico, 1 project
Tunisia, 1 project

FOSC Consortium and additional funders, FOSC Call 2019

FOSC consortium and additional funders of the 2019 call

The FOSC Consortium consists of 28 partners from Europe, Africa and Latin America and has the support of the European Commission. Two additional funders joined in the 2019 call for proposals. The FOSC consortium is coordinated by ANR, France and the Call Office of the 2019 call is organized by BLE, Germany.

FOSC Consortium

Algeria - MESRS: Ministry of Higher Education and Scientific Research
Belgium - EV-ILVO: Flanders Research Institute for Agriculture, Fisheries and Food
Belgium - FNRS: Fund for Scientific Research-FNRS (F.R.S-FNRS)
Belgium - FWO: The Research Foundation – Flanders
Burkina Faso - FONRID: National Fund for Research and Innovation for Development
Egypt - MHESR: Ministry of Higher Education and Scientific Research
France - ANR: National Research Agency
France - INRAE: National Research Institute for Agriculture, Food and Environment
Germany - BLE: Federal Office for Agriculture and Food
Germany - BMEL: Federal Ministry of Food and Agriculture
Honduras - FHIA: Honduras Foundation for Agricultural Research
Hungary - AM: Ministry of Agriculture
Hungary - NKFIH: National Research, Development and Innovation Office
Ireland - DAFM: Department of Agriculture Food and the Marine
International - CIHEAM-IAMB: International Centre for Advanced Mediterranean Agronomic Studies
Italy - MIPAAF: Ministry of Agriculture, Food and Forestry Policies
Kenya - MOEST: Ministry of Education Science and Technology
Norway - RCN: The Research Council of Norway
Panama - SENACYT: National Secretary of Science, Technology and Innovation
Senegal - MESRI: Ministry of Higher Education, Research and Innovation
South Africa - NRF: National Research Foundation
Sweden - FORMAS: Research Council for Environment, Agricultural Science and Spatial Planning
The Netherlands - LNV: Ministry of Agriculture, Nature and Food Quality
The Netherlands - WR: Wageningen Research
Turkey - TAGEM: Ministry of Agriculture & Forestry/Gen. Directorate of Agricultural Research & Policies
Turkey - TÜBITAK: The Scientific and Technological Research Council of Turkey
United Kingdrom - DEFRA: Secretary for Environment, Food and Rural Affairs
Inter-American Institute for Global Change Research - IAI: Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, United States, Uruguay, Venezuela

External organisations that are not part of FOSC Consortium, but joined the call as funders are:

Ivory Coast - PASRES: Strategic Support Program for Scientific Research
Morocco - MENFPESRS: Ministry of National Education, Professional training, Higher Education and Scientific Research


The 17 FOSC projects from the 2019 call

- URBANFOSC
- BIO-BELIEF
- BICEPS
- SECUREFOOD2050
- CLIMAQUA
- CRRIsP
- NutriGreen
- C4C
- CHIAM
- Sus-Agri-CC
- ThermoK
- BLUE-CYCLING
- CREATE
- SALAD
- PHEALING
- TRUSTFARM
- SAFOODS

URBANFOSC

Urban Food Resilience under Climate Change Challenges

Partners of the project

The Netherlands – VU Amsterdam (VU)

Kenya – Moi University (MU)

France – French Agricultural Research Centre for International Development (CIRAD)

South Africa – University of the Western Cape (UWC)

Algeria - University of Constantine 3 (UC3)

CONTEXT

Achieving food and nutrition security in African (secondary) cities is an important challenge within the context of rapid urbanization, climate change and the increased production for international value chains.

OBJECTIVES

URBANFOSC aims to contribute to the development and implementation of transformative adaptation strategies that enhance the resilience of urban food systems.

ACTIVITIES & EXPECTED RESULTS

The project uses a food systems mapping and modelling approach to identify critical linkages, actor networks and leverage points in urban food systems. Network models allow to understand the cascading impacts of climate change on the urban food system. Using such food system understanding, the project will co-design with stakeholders in government, the private sector and civil society, possible interventions and governance processes that contribute to improved urban nutrition and a higher resilience of urban food systems to climate change. Specific attention will be given to the role of international value chains operating in the sourcing regions of urban fresh produce in terms of competition for land and water resources, or as leverage points for new value chains feeding into the urban food system. The consortium will work in 3 African secondary cities that differ in anticipated climate change impacts and types of international value chain interaction. This allows developing a generic approach that has high transferability to other (secondary) cities across Africa. A transdisciplinary approach is chosen in which stakeholders are playing a role throughout the full project life-time and where consortium members provide complementary expertise to address the multi-dimensionality of urban food systems in an integrated manner.

COORDINATOR CONTACT

Prof. Dr. Ir. Peter Verburg
VU Amsterdam (VU) – The Netherlands

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 759.600

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

BIO-BELIEF

BIOfortification of common Bean to promote healthy dIEt and Food security in a context of climate variation

Partners of the project

South Africa – University of Pretoria (UP)

Kenya – International Center for Tropical Agriculture (CGIAR-CIAT)

Italy – Council for Agricultural Research and Economics (CREA)

Italy – National Research Council-Institute of Agricultural Biology and Biotechnology (CNR-IBBA)

France – Aix-Marseille University (AMU)

Brazil – Brazilian Agricultural Research Corporation (Embrapa)

Italy – Blumen Group SPA

CONTEXT

Common bean (Phaseolus vulgaris L.) is a staple food in many regions in the world. Bean seeds are a major source of dietary fibers, essential amino acid-rich proteins, some vitamins and often display a high content in essential minerals. However, these minerals are scarcely bioavailable, mainly due to the presence of phytic acid (PA) and phenolic compounds. Besides, about 60% of common beans produced worldwide are grown in regions subjected to water stress, thus besides diseases, drought is the most important factor that contributes to yield reduction.

OBJECTIVES

BIO-BELIEF aims to select new biofortified and drought resilient bean lines, in order to promote a healthy diet in a general frame of food security.

ACTIVITIES & EXPECTED RESULTS

The project will release breeding lines with high nutritional values and develop nutritional improved and drought resilient beans suitable to be grown in Europe, Africa and Latin America (last two are regions where bean is a major staple food). BIO-BELIEF will capitalize previous works carried out by some partners that have selected biofortified lines with reduced level of PA, increased iron content and improved drought resilience. About 20 lines will be tested for seed quality in response to drought treatment in two continents. Meanwhile, the biofortification traits will be introgressed in the drought resilient genetic backgrounds. The innovative technology of Genome Editing will also be applied to explore and modify candidate genes involved in drought resilience and also in determining PA and Fe content. The biofortified lines will be exploited by preparing bean-based recipes, which will be characterized for their nutritional profile and micronutrient bioavailability. The selected lines will be used for testing by the consumers to validate new biofortified diets for European, African and South American populations.

COORDINATOR CONTACT

Prof. Karl Kunert

University of Pretoria (UP) – South Africa

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 588.200

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

BICEPS

Biochar Integration in Small-Holder Cropping Systems – Economy, Food, Product Value Chains, Climate Change Resilience and Soil Fertility

Partners of the project

- **Sweden** – Swedish University of Agricultural Sciences (SLU)
- **Norway** – Norwegian Geotechnical Institute (NGI)
- **South Africa** – University of KwaZulu-Natal (UKZN)
- **Norway** – Norwegian University of Life Sciences (NMBU)
- **Kenya** – University of Nairobi (UONBI)

CONTEXT

Biochar integration in small-holder agriculture is a transformative adaptation of the food production system to achieve climate mitigation, climate resilience and sustainable intensification.

OBJECTIVES

BICEPS aims to quantify the contribution of biochar to climate change resilience, improved food security and profitability and to address knowledge gaps regarding biochar use in small-holder agriculture contexts in sub Saharan Africa.

ACTIVITIES & EXPECTED RESULTS

The project will study the biochar contribution to climate change mitigation using a life-cycle analysis approach. Here, it is important to use a system perspective to assess both direct climate mitigation but also to consider trade-offs. Adoption of biochar will be dependent on profitability at farm level. Therefore, the cost-benefit of biochar integration and the impacts of produce quantity and quality on food value chains will be evaluated. Interaction between biochar and the nitrogen cycle will be studied to evaluate nitrogen use efficiency and the sustainability of nitrogen supply in the cropping system. The project will also study the importance of biochar-soil-water-crop interaction for improved climate and (drought) resilience, using a range of state-of-the-art methodologies. The project will interact with local farming communities in Kenya and South Africa and test biochar integration in on-farm trials but also utilize data from on-going research in other countries. The results can be utilized to guide policy development on how biochar can be integrated in small-holder farming systems, and how bottlenecks that prevent the integration can be identified and addressed. Increased use of biochar can contribute to Agenda2030, SDG1: No Poverty, SDG 2: Zero Hunger and SDG13: Climate Action.

COORDINATOR CONTACT

Dr. Erik Karltun

Swedish University of Agricultural Sciences (SLU) – Sweden

DURATION
01/04/2021 – 31/05/2024

TOTAL GRANT
€ 1.015.000

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

SECUREFOOD 2050

Improving resilience and food security in 2050 climate through soilless precise agricultural techniques and irrigation with wastewater properly treated by innovative technologies to ensure food safety

Partners of the project

Italy – University of Florence (UniFI)

Algeria – University of Bejaia

Belgium – University of Liège (Uliège)

Egypt – National Research Centre (NRC)

Morocco – Cadi Ayyad University Marrakesh (UCAM)

Italy – University of Turin (UniTO)

CONTEXT

Agriculture is already and will be still more affected by climate change, which is likely to cause a reduction in natural resources (in particular freshwater and fertile soil), as well as significant changes in plant growth conditions. The low availability of water for irrigation and fertile soil for cultivation are obstacles for achieving a strong resilience of food systems.

OBJECTIVES

SECUREFOOD2050 aims at mitigating the impact of climate changes by using innovative technologies for:

1) Increasing the availability of water suitable for irrigation;
2) Reducing water use and demand;
3) Reducing the dependence on fertile land in countries predominantly characterized by sandy soils;
4) Increasing the willingness of farmers to use treated wastewater (TWW) for irrigation and of consumers to buy the agricultural products obtained by irrigation with TWW.

ACTIVITIES & EXPECTED RESULTS

The technical solutions aim at the replacement of fresh water with TWWs obtained by using an innovative concept of constructed wetlands and bioaugmented septic tanks. The project will investigate aeroponics and biochar assisted cultivation systems, as innovative soilless agricultural techniques for crop (e.g. rocket and strawberry) production, in which TWWs will be adopted for irrigation. Experiments will be carried out under current 2050 worst climatic scenario. The project will monitor the safety and quality of the food products and will take care of the social aspects concerning consumer preferences and acceptability, as well as farmer's possible reluctances to using TWW for irrigation. The results will be integrated with data referred to materials and resources used with the various cultivation techniques applied in the different climatic-environmental scenarios, to perform a life-cycle assessment of the processes adopted for food production.

COORDINATOR CONTACT

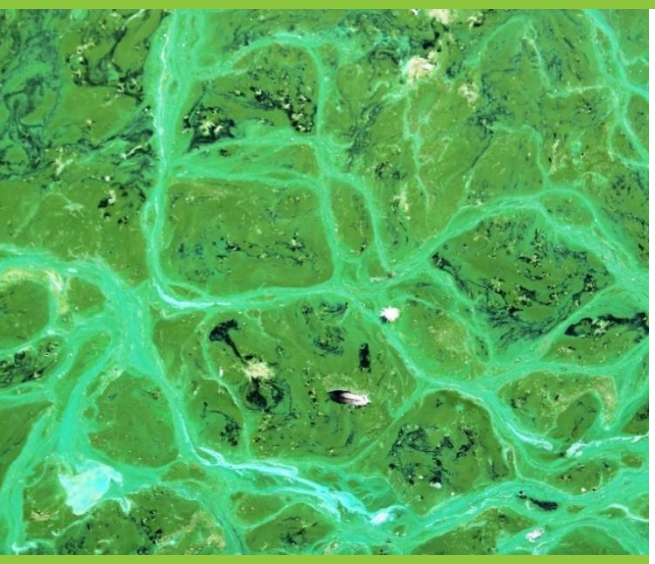
Massimo Del Bubba

University of Florence (UniFI) – Italy

DURATION
01/09/2021 – 31/08/2024

TOTAL GRANT
€ 556.000

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555



CLIMAQUA

Establishing an innovative and transnational feed production appoarch for reduced climate impact of the aquaculture and future food supply

Partners of the project

- **Germany** – Institute for Food and Environmental Research (ILU)
- **Germany** – German Institute for Food Technologies (DIL)
- **Norway** – Nofima
- **Norway** – Norwegian University of Science and Technology (NTNU)
- **South Africa** – Karoo Catch
- **South Africa** – Agricultural Research Council (ARC)
- **Kenya** – Kenya Agricultural and Livestock Research Organization (KALRO)
- **South Africa** – Institute for Environmental Biotechnology, Rhodes University (EBRU)

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 818.969

CONTEXT

87% of total GHG emissions are associated to feed production. CLIMAQUA fosters the implementation of an innovative aquaculture-based food system with reduced climate impact by considering technological and non-technological aspects. CLIMAQUA builds on basic and applied knowledge gained from aquaculture and feed production, and particularly considers site-specific environmental conditions to establish most efficient and environmentally benign feed production to substantially reduce GHG emissions from the food system aquaculture.

OBJECTIVES

The main objectives of CLIMAQUA are the development of a flexible *Athrospira platensis* biomass production system, that can be carried out in a decentralized manner in the areas of aquaculture and fish processing, and thus contributing to a regional development and GHG mitigation. CLIMAQUA will concentrate on the development of specific decentralised technologies adapted to local environmental conditions for feed production based on *A. platensis* combined with the treatment of low-value side-streams and recirculation of nutrients from inorganic and organic-rich wastewater, sludge and seafood residues from aquacultures in photo-trophic or heterotrophic *A. platensis* cultivation.

ACTIVITIES & EXPECTED RESULTS

CLIMAQUA results in an innovative process for converting and recirculating aquaculture side-streams as *A. platensis*-based feed useable in aquacultures. The aim is to substantially reduce GHG emissions by considering geographic and site-specific characteristics (temperature, daylight duration etc.) for *A. platensis* biomass production and to design almost completely digestible algae-based feed for salmon and catfish for the generation of future resilient food systems. Furthermore, CLIMAQUA for the first time investigates climate change related aspects on aquaculture in two different regions in the world, provides similar measures against climate change considering technology adaptable on climate conditions and fosters the implementation of sustainable and local food systems. Particularly the minimised dependency on arable land is an essential measure for dealing with climate change caused dry and exhausted soils in Africa and Europe in the future. The reduction of climate gas emissions, when developed technology is implemented, is expected by 50%.

COORDINATOR CONTACT

Apl. Prof. Dr. Daniel Pleissner

Institute for Food and Environmental Research (ILU) – Germany

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

CRRIsP

Climate Resilient and Responsible Innovations in Potato

Partners of the project

Germany– TH Bingen (THB)

Ireland – Teagasc

The Netherlands – Wageningen University and Research (WUR)

Kenya – Kenya Agricultural and Livestock Research Organization (KALRO)

South Africa – University of Johannesburg (UJ)

CONTEXT

The events of climate change e.g., increasing temperatures, erratic rainfall, will lead to new or more severe abiotic and biotic stresses challenges in potato production systems globally, which are likely to affect the crops entire value chain. The consequences are lower - or even total loss of potato crop yield and the effects will differ in different agro-ecologies. An understanding of the effect Climate change will have on Potato value chains will allow mitigation steps be undertaken from the perspectives of breeding agronomy and socioeconomic adaptations.

OBJECTIVES

CRRIsP aims to add value on the state-of-the-art knowledge by:
1) analyzing trade-offs and synergies of developed innovations and their applicability to different farming, market and food systems;
2) deploying innovative tools and solutions in variety development, seed systems, agronomy, post-harvest loss reduction alongside mutual capacity building;
3) engagement in knowledge exchange and dissemination on production, storage, market and value chain related topics; and
4) develop and disseminate training and communication material for different audiences from lab to fork.

ACTIVITIES & EXPECTED RESULTS

Given the scope and time-frame of the project, partners identified specific case studies for the generation of results to be used for the assessment of their respective transferability and scalability. Overall, the project envisions that the use of this innovative approach and new knowledge products helps to accelerate the innovation process that is needed to achieve sustainable local and regional, environmentally friendly, economically viable and socially inclusive potato system approaches that significantly contribute towards the overarching goal of achieving resilient food security under changing climates.

COORDINATOR CONTACT

Prof. Elmar Schulte-Geldermann
TH Bingen (THB) – Germany

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 900.000

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

NutriGreen

Promoting Green Nutrition for the Sahel region

Partners of the project

Sweden – Swedish University of Agricultural Sciences (SLU)

Germany – Centre for Rural Development/Humboldt-Universität Berlin (SLE)

Burkina Faso – National Center for Scientific and Technological Research (CNRST)

Senegal – Cheikh Anta Diop University (UCAD)

CONTEXT

Senegal and Burkina Faso are already exposed to an increase in extreme weather events such as droughts and floods, due to climate change. As a result, the yields of staple foods are set to decline significantly during the 21st century, adding more pressure on the already highly strained local food systems. An overlooked and underutilized group of plants that could fill this shortfall are indigenous vegetables and tree crops. They are well-adapted to the local climate, less affected by pests and diseases and therefore require fewer inputs. Moreover, many of them are highly nutritious and often part of the resident food culture.

OBJECTIVES

NutriGreen will research these traditional plants to understand how their production and consumption can be amplified through sustainable nutri-sensitive food value chains (VCs) to foster a climate-resilient local agri-food system, especially filling the food supply gap during the seasonal hunger period.

ACTIVITIES & EXPECTED RESULTS

To reduce volatility in agri-food production and food markets, the project will analyse, identify and test innovative technologies in the production, post-harvest/processing and marketing of selected traditional plants in Gaoua in Burkina Faso and Louga in Senegal. To engage new consumers and improve food security, NutriGreen will develop new products, healthy recipes and information campaigns. The research will apply a transformative action learning and co-creation of knowledge approach. The project will test agro-meteorological learning, sustainable intensification and diversification methods with women farmer groups participating in climate field schools. It will also support agripreneurs by co-developing and testing new business models. Both groups will be assessed in framed field experiments treatment (participants) and control groups (non-participants).

COORDINATOR CONTACT

Prof. Konstantinos Karantininis

Swedish University of Agricultural Sciences (SLU) – Sweden

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 790.600

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

C4C

CropsForChange; Tackling the global warming effects in crops

Partners of the project

Italy– CREA Research Centre for Genomics and Bioinformatics

Italy – University of Milan (UniMi)

South Africa – Stellenbosch University (SU)

Turkey – Bati Akdeniz Agricultural Research Institute

Algeria – University Kasdi Merbah Ouargla (UKMO)

Morocco – Mohammed I University (UMP)

CONTEXT

Global warming has a direct impact on agriculture: in general, low water availability and supra-optimal temperatures negatively affect the plant reproductive processes and therefore hamper the normal fruit or seeds development, thus limiting both crop yields and quality of fruit/grain production.

OBJECTIVES

C4C aims to face the impact of heat and drought stress, in two important botanical families for human food supply: solanaceae and cereals, using eggplant, rice and wheat as target systems.

ACTIVITIES & EXPECTED RESULTS

The large amount of germplasm available constitute a great source of variability and will be explored to highlight the genomic regions underlying key genes and factors involved in plant adaptation and for crop breeding. Moreover, the orthologs sequences of key genetic factors related to heat and drought stress adaptation already identified by the C4C partners will be isolated in the other species under study and then submitted to deep functional characterization, including genome editing in rice and eggplant. The integration of genetic resources and emerging chemical analytical approaches such as cell wall profiling and metabolomics can contribute to a more convicting identification in various mapping populations of the chromosomal regions underlying QTLs and moreover, to assist the functional characterization of key genes involved in the response to stresses. All this information will set the basis to transfer the acquired knowledge in breeding processes which will lead to the development of lines with an improved adaptation to adverse conditions caused by global warming and water shortage.

COORDINATOR CONTACT

Dr. Giuseppe Leonardo Rotino

CREA Research Centre for Genomics and Bioinformatics – Italy

DURATION
01/07/2021 – 30/06/2024

TOTAL GRANT
€ 486.600

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

CHIAM

Integrated chia and Oyster mushroom system for Sustainable food value chain in Africa

Partners of the project

- **Kenya** – Dedan Kimathi University of Technology (DeKUT)
- **Hungary** – Pilze-Nagy Ltd. (PILZE)
- **Hungary** – Bay Zoltan Nonprofit Ltd. for Applied Research (BZN)
- **Germany** – University of Hohenheim (UH)
- **Egypt** – Agricultural Research Center (ARC)
- **Morocco** – University of Sultan Moulay Slimane (USMS)
- **Kenya** – Keyrio Farm
- **Algeria** – Scientific and Technical Research Center on Arid Regions (CRSTRA)

FOSC
ERA-NET Cofund on Food Systems and Climate

LEAP-Agri

FACCEJPI

CONTEXT

Enhancing food and nutrition security in Africa is essential to improved livelihoods and life opportunities for resource-poor individuals and households. The efficiency of the primary production of African farms has to be improved, and additionally, it is urgent to put more emphasize on the sustainability of farming systems. This means a significant challenge for the local agricultural communities.

OBJECTIVES

CHIAM aims to create a complex agro system, which will result in novel functional foods and use their by-products to feed animals and create energy in a biogas plant.

ACTIVITIES & EXPECTED RESULTS

Developing biomass-based farm operations in Africa can promote the sustainable utilization of the available and new feedstock creating value for local society and protecting the environment with sustainable high-quality solutions. Both chia seeds (Salvia hispanica L.) and oyster mushroom (Pleurotus spp.) are considered as functional foods that provide health benefits, when they are consumed at efficacious levels as part of a varied diet on a regular basis. During the project, chia seeds production will be improved through breeding. The effectiveness and acceptability of the use of chia seeds and oyster mushrooms for fortification of local products will be examined. In order to create the circularity of farming, waste of chia production will be evaluated for utilization as substrate for oyster mushroom production. Spent mushroom substrate as animal feed will be examined, while the biogas production based on manure will be optimized. Creating an integrated system of chia and oyster mushrooms can improve the carbon nutrient circle and utilize the lignocellulosic by-products, wastes in a more efficient way, and promote fortification of local foods and in Africa to improve household nutrition and economic status.

COORDINATOR CONTACT

Dr. Monica Mburu
Dedan Kimathi University of Technology (DeKUT) – Kenya

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 610.400

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

Sus-Agri-CC

Innovative biofertilizers boosting yield of crop: Toward Sustainability of Agricultural systems against the Climate Change in arid and semi-arid zones

Project Partners

- **Morocco** – Cadi Ayyad University Marrakesh (UCAM)
- **Morocco** – Ibn Zohr University (UIZ)
- **Germany** – Leibniz Institute of Plant Genetics and Crop Plant Research (IPK)
- **France** – National Research Institute for Sustainable Development (IRD)
- **Turkey** – Ankara University
- **Algeria** – University of Mascara (UM)
- **Japan** – Niigata University (NU)
- **Tunisia** – University of Tunis El Manar (UTM)
- **Mexico** – University of Sonora (UNISON)

DURATION

01/06/2021 – 30/06/2024

TOTAL GRANT

€ 487.600

FOSC
ERA-NET Cofund on Food Systems and Climate

LEAP-Agri

FACCEJPI

CONTEXT

The FAO estimates a 34% increase in the world population by 2050. As a result, the productivity of important staple crops such as cereals and horticultural species needs to be boosted by an estimated 43%. Against the mosaic global climate change and shifting arable land ranges, plant and soil sciences play a primordial role in finding solutions to the internationally shared challenges of ensuring sustainable agricultural and biomass production. However, to effectively meet these challenges and demands, knowledge obtained from essential plant and soil sciences must be connected to innovative applications in agriculture and plant cultivation.

OBJECTIVES

Sus-Agri-CC aims at improving the growth and development of cultures with high interest by the adoption of innovative practices to improve soil fertility, preserving water resources, respecting the environment, and ensuring the development of sustainable agriculture. Our main goals are: (i) exploit sustainable biological practices integrating biological and organic biofertilizers (compost and microorganisms) that boost plant yield, quality or even novel functionality, and tolerance to abiotic stresses to improve agricultural production, (ii) understand the molecular traits of economically important crops under a variety of environmental conditions.

ACTIVITIES & EXPECTED RESULTS

By combining the complementary expertise of different research teams and companies from Morocco, France, Germany, Turkey, Tunisia, Algeria, Japan, and Mexico, the project specifically aims at: **(1)** developing cultivation technologies verified and demonstrated in the field to tackle some challenges simultaneously, including food insecurity, malnutrition and other diet-related health issues, rural poverty, and mitigation of climate change, **(2)** exploitation of beneficial indigenous microorganisms as biofertilizers and agents to achieve sustainable and highly productive agriculture and to mitigate climate change, **(3)** recycling green and agro-industrial wastes into compost and biostimulants, thereby allowing their reuse in agriculture to improve soil fertility/functioning and crops yield, **(4)** understanding of the phenotypes and molecular traits of leading staple food crops (cereals and horticultural crops) under diverse environmental conditions.

We expect producing outcomes and unique and innovative concepts that will contribute to advance agricultural practices, improve the design, control growth, increase the production and quality of essential food crops based on comprehensive ex-situ (controlled greenhouse) or field-verified experiments

COORDINATOR CONTACT

Prof. Abdelilah Meddich
Cadi Ayyad University Marrakesh (UCAM) – Morocco

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

ThermoK

Thermophilic breakdown of keratin-laden biomass waste

Partners of the project

- **Norway** – University of Bergen (UiB)
- **United Kingdom** – University of Exeter (UoE)
- **France** – French Alternative Energies and Atomic energy Commission (CEA)
- **South Africa** – University of the Free State (UFS)
- **Kenya** – University of Naïrobi (UoN)
- **Norway** – Norwegian Research Centre (NORCE)

CONTEXT

Keratin is a fibrous and recalcitrant structural protein and is the third most abundant polymer in nature after cellulose and chitin. A wide spectrum of animals have developed a diversity of keratins used as structural parts of their outer protection which make up major component of feathers, hair, horns, hooves, cloves, nails etc. Keratin-laden tissues represent a significant challenge for the animal rendering industry. For example, feathers consist of more than 90% keratin and represent a huge waste product of the poultry industry, where most ends up in landfills or is being burned. Today, most feather waste is discarded or ineffectively rendered for animal feed or fertilizer.

OBJECTIVES

ThermoK will address the application of selected anaerobic thermophilic bacteria which can be optimised for keratin-laden waste material degradation as well as the understanding of the enzyme activities within the bacterial species responsible for this degradation.

ACTIVITIES & EXPECTED RESULTS

This will lead to improved control and understanding of the overall keratin-degrading process and its improvement and efficiency by using organisms expressing the required activities or using novel enzyme cocktails of thermophilic keratin degrading enzymes in vitro optimised for keratin breakdown in a cost effective and controllable manner. The project will bring together a multidisciplinary team of academics in order to take the results obtained to a transfer level 5 and above, including upscaling of the process. The project will contribute to the designing of more sustainable and resilient food systems and to the vision of a circular economy by using waste products and converting them to other valuable commercial products including peptides, amino acids, fish feed and agricultural fertilizers..

COORDINATOR CONTACT

Prof. Nils-Kåre Birkeland

University of Bergen (UiB) – Norway

DURATION
01/06/2021 – 30/06/2024

TOTAL GRANT
€ 991.251

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

BLUE-CYCLING

Integrated aquaculture and agriculture for resource-efficient food production

Partners of the project

Sweden – University of Gothenburg (UGOT)

The Netherlands – Wageningen University and Research (WUR)

Germany – Leibniz-Institute of Vegetable and Ornamental Crops (IGZ)

Honduras – Foundation for Integral Sustainable Development (FND)

South Africa – Stellenbosch University (SU)

Norway – SINTEF Nord

United Kingdom – University of Greenwich (GU)

Kenya – Maseno University (MU)

CONTEXT

One of the greatest challenges imposed by climate change is the ability to provide sustainable management of land and water resources to secure food for a growing population. Integrated aquaculture-agriculture (e.g. aquaponics) is an exemplary resource-efficient technology that allows for nutrient, water and energy recycling within the concept of safe and sustainable food production. Due to its controlled environment, aquaponics is able to deliver fresh food with minimal resource inputs despite external climatic conditions (e.g. cold/dark winters or drought in arid regions).

OBJECTIVES

BLUE-CYCLING aims to advance current aquaponics designs with the goal of developing this technology from farm to fork through innovation in existing integrated fish production techniques and state-of-the-art greenhouse designs in conjunction with permaculture and agroforestry approaches. Such technology, based on optimal use of water, waste and energy, will aid in achieving sustainable development goals for human health and nutrition, resilient food value chains, and regional/local food production.

ACTIVITIES & EXPECTED RESULTS

The project will achieve this by:

1) developing models that support the environmental, economic, and social benefits of different integrated aqua-agriculture technologies;

2) integrating results of socio-economic and environmental parameters into the design of new technologies;

3) examining demonstration facilities that are implementing novel permaculture and agroforestry practices.

Taken together, the project will present reliable data on how integrated farming systems can contribute to agricultural resilience, both environmental and economic, and deliver a meaningful understanding of new commercial applications, societal and economic goals for integrated farming, as well as policy change in this important field.

COORDINATOR CONTACT

Dr. Alyssa Joyce

University of Gothenburg (UGOT) – Sweden

DURATION
31/01/2021 – 31/05/2024

TOTAL GRANT
€ 1.869.300

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

CREATE

Cross-Border Climate Vulnerabilities and Remote Impacts of Food Systems of the EU, Turkey and Africa: Trade, Climate Risk and Adaptation

Partners of the project

- **Turkey** – Ankara University Water Management Inst. (ENSTITU**SU**)
- **The Netherlands** – FutureWater (FW)
- **Egypt** – National Research Center (NRC)
- **Egypt** – Green Power for Agriculture and Irrigation (GPAI)
- **The Netherlands** – R2Water Research and Consultancy (R2W)
- **Morocco** – National School of Agriculture (ENAM)
- **Morocco** – University of Sultan Moulay Slimane (USMS)
- **Turkey** – GTE Carbon, Sustainability and Energy Consultancy Co. (GTE)

CONTEXT

Nowadays, climate risk and impact assessments of food-systems focus typically on the production within a geographic area only. Consequently, knowledge and research on the cross-border climate vulnerabilities of food-systems have hardly received any attention.

OBJECTIVES

CREATE aims to develop a novel cross-border climate risk/impact assessment methodology for food value chains based on embedded resource use (e.g water, land, carbon) trade concept that maps representative connections between European socio-economic activities and remote climatic hazards in Africa and in Turkey.

ACTIVITIES & EXPECTED RESULTS

CREATE's climate assessment starts at the farm level in producing regions in Africa and Turkey, focusing on crop yield changes under different climatic stressors and translates these impacts in a cascading way to the food systems and value chain in the EU in terms of vulnerabilities. It also looks at the socio-economic and environmental impacts of these trade relations. The study will focus on four case studies: the Netherlands (Europe, importing country), Turkey (Europe, importing/exporting country), Morocco (Africa, exporting country), and Egypt (Africa, exporting country). Cross-border climate risk analysis will be performed individually, and stakeholder workshops will be organized. Country assessments will include climate adaptation measures and policy recommendations. The outcomes will be used to increase awareness of the risks that climate change poses to the agro-food trade and the economy. They can contribute to efforts by the governments (macro-scale), the communities (meso-scale), agricultural producers (micro scale) in the case study countries, by providing essential information for promoting actions towards mitigating the consequences of climate change on agro-food trade.

COORDINATOR CONTACT

Assoc. Prof. Goksen Capar
Ankara University (ENSTITU**SU**) – Turkey

DURATION
01/09/2021 – 31/08/2023

TOTAL GRANT
€ 709.000

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

SALAD

Saline Agriculture as a Strategy to Adapt to Climate Change

Partners of the project

The Netherlands – VU Amsterdam (VU)

Belgium – Flanders Research Institute for Agriculture, Fisheries and Food (ILVO)

Belgium – KU Leuven

Egypt – Kafrelsheikh University (KFS)

Germany – Carl von Ossietzky University Oldenburg (UoL)

Italy – University of Florence (UniFI)

Morocco – Mohammed VI Polytechnic University (UM6P)

The Netherlands – The Salt Doctors BV (SD)

The Netherlands – Salt Farm Foundation (SFF)

The Netherlands – University of Applied Sciences Van Hall Larenstein (VHL)

Morocco – Cadi Ayyad University Marrakesh (UCAM)

DURATION
01/06/2021 – 31/05/2024

TOTAL GRANT
€ 1.312.300

FOSC
ERA-NET Cofund on Food Systems and Climate

LEAP-Agri

FACCEJPI

CONTEXT

Climate change impacts coastal areas by sea-level rise and more frequent droughts. These events increase the salinity in agricultural soils, affecting food systems overstretched by an increasing global population. Progressing salinisation is one of the major drivers of soil degradation in Europe and North Africa, exerting increasing pressure on conventional farming.

OBJECTIVES

SALAD aims at improving the resilience of food production in saline and potentially saline agricultural areas in the Mediterranean and North Sea regions by:

1) supporting the development and sustainable use of innovative salt-tolerant crops;

2) identifying and further developing crop cultivation suited to saline conditions;

3) exploring and testing innovative market development techniques and instruments with the goal of upscaling crop/food chains across the regions;

4) exchanging knowledge and transferring practical and adaptive solutions among stakeholders.

ACTIVITIES & EXPECTED RESULTS

Adopting a novel and innovative approach, SALAD focuses on implementing climate-smart agricultural solutions. First, by investigating prospects for upscaling production from farm to regional scale of four different crops under saline conditions: potatoes, New Zealand spinach, quinoa and tomatoes. Second, by examining business models for entrepreneurs and asset owners through comparative case analyses. We compare the effectiveness of different approaches and disseminate solution-oriented recommendations. The project works with producers on practical workshops dedicated to farming under saline conditions. Further, it investigates opportunities and constraints for upscaling, including the institutional landscape of saline agriculture initiatives and involvement of investors. Finally, the project explores the relevant EU and North African policies on climate change adaptation, food security and sustainability and addresses horizontal, diagonal and vertical upscaling of saline food systems.

COORDINATOR CONTACT

Dr. Katarzyna Negacz
VU Amsterdam (VU)
- The Netherlands

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

PHEALING

Post Harvest losses mitigation by improved plant hEALING

Partners of the project

Belgium – KU Leuven

Germany – Rheinische Friedrich-Wilhelms-University Bonn (Uni Bonn)

Kenya – University of Nairobi (UONBI)

Kenya – South Eastern Kenya University (SEKU)

South Africa – University of KwaZulu-Natal (UKZN)

CONTEXT

Plant healing may represent an important genetic potential to reduce post-harvest losses with limited reliance on storage facilities that are costly and energy consuming. The use of natural plant healing mechanisms and microbial antagonists have the potential to lead to methods that can be applied across a wide range of varieties preferred by growers, consumers and industries.

OBJECTIVES

The specific objectives of PHEALING are to:
1) study and characterize plant healing mechanisms in model crop species (fruit (tomato), tuber (potato) and storage root (cassava));
2) identify conditions conducive for plant healing in order to start exploitation of this natural process;
3) identify and characterize genetic diversity for plant healing in the selected crop species to help tapping in this yet unexplored genetic potential;
4) test novel biocontrol approaches including bacteriophages and priming molecules to induce plant healing and to reduce post-harvest losses.

ACTIVITIES & EXPECTED RESULTS

The project will build on a collaborative work with farmers and processors that will enable identification of specific post-harvest losses as well as the bottlenecks in the implementation of novel methods, fostering transdisciplinary approaches. The project will be embedded in value chains, EU focus groups and EU-Africa research collaboration initiatives in order to maximize the benefits of the findings. The project combines: 1) incremental adaptation by increasing efficiency in post-harvest handling of crops and reducing waste, 2) systemic adaptation by unlocking the potential of genetic diversity in plant healing and 3) transformative adaptation by providing the value chain with carbon-neutral methods.

COORDINATOR CONTACT

Prof. Hervé Vanderschuren
KU Leuven – Belgium

DURATION
01/10/2021 – 30/06/2024

TOTAL GRANT
€ 680.100

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

TRUSTFARM

Towards Resilient and sUStainable integrated agro-ecosystems Through appropriate climate-smart FARMing practices

Partners of the project

Germany – Leibniz Institute of Agricultural Development in Transition Economies (IAMO)

Egypt – Cairo University (CU)

Italy – University of Bari (UniBa)

Morocco – National Institute for Agricultural Research (INRA)

France – French Agricultural Research Centre for International Development (CIRAD)

Morocco – Mohammed VI Polytechnic University (UM6P)

Senegal – Cheikh Anta Diop University of Dakar (UCAD)

Morocco – Cadi Ayyad University Marrakesh (UCAM)

CONTEXT

Agriculture in the Mediterranean and Sub-Saharan Africa is increasingly a challenging sector that's shaped by climate change.

OBJECTIVES

The main aim of the TRUSTFARM is to design integrated agro-ecosystems (incorporating livestock production into cropping systems for enhancing ecosystem services in smallholder) based on the conservation principles of using natural resources and the circular economy in order to make production systems more resilient to climate change. TRUSTFARM builds on research and stakeholders' mobilisation in five case studies areas in France, Italy, Egypt, Morocco and Senegal and covering a diversity of natural, socio-economic and institutional contexts in the EU, North Africa, and Sub-Saharan Africa.

ACTIVITIES & EXPECTED RESULTS

Core challenges in the case study countries will be identified by their climate impact variability on food security. In cooperation with stakeholders, TRUSTFARM will develop Multi-Stakeholder Innovation Platforms (MIPs) to prioritise and select the best-fit innovative Climate-Smart Farm Practices (CSFPs) for each case study. A toolbox of innovative pathways will be developed that contains the following: 1) Identification and promotion of food crops with high yielding germplasm that are resistant to heat and disease; 2) Soil and water conservation to improve productive capacity; 3) Adoption of best practices in ruminant husbandry. The project will design integrated agro-ecosystems based on the selected pathways with on-farm trials. The environmental and economic impacts of the designed systems will be assessed using Life Cycle Analysis. To increase and diversify farmers' income, two business models will be developed: 1) Reduce Reuse Recycle to produce high-quality compost; 2) Dairy and meat products and wool from small ruminants. TRUSTFARM will select one or both business models according to the needs of each case study with the stakeholders through the MIPs. The integrated agro-ecosystem and CSFPs will be disseminated through social media, taking advantage of farmers' smartphone usage. Among others, this will result in a strong EU and African partnership for R&I to achieve the goals of sustainability and food security.

COORDINATOR CONTACT

Dr. Osama Ahmed

Leibniz Institute of Agricultural
Development in Transition Economies (IAM0) – Germany

DURATION
01/06/2021– 31/05/2024

TOTAL GRANT
€ 1,137,386

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

SAFOODS

Strengthening African FOOD Systems in the face of climate change and food insecurity

Partners of the project

France – French Agricultural Research Centre for International Development (CIRAD)

United Kingdom – Natural Resources Institute, University of Greenwich (NRI)

Senegal – Senegal Agricultural Research Institute-Bureau of Macro-Economic Analysis (ISRA-BAME)

Côte d'Ivoire – Nangui Abrogoua University (UNA)

CONTEXT

Food and nutrition insecurity is a worldwide problem that particularly affects Sub-Saharan Africa. By 2050, West African countries will face rapid demographic growth and urbanization with worsening climate-related constraints on food systems; hence there is an urgent need to propose ways to make food systems more resilient. Despite their importance for health and the economic sector, fruits & vegetables have mostly been neglected in studies addressing food security and climate change.

OBJECTIVES

SAFOODS' goal is to enhance the resilience of food systems through developing adaptation strategies. Objectives are to assess climate change-related risks on fruits & vegetables food systems and to co-design innovations with food chain stakeholders.

ACTIVITIES & EXPECTED RESULTS

Two complementary strategies will be explored:
1) the reduction of food loss and waste;
2) the diversification of both cropping systems and foodsheds.
The project will focus on two city-region food systems in two countries with diverse climate conditions facing food security and climate related challenges: Dakar and Ziguinchor in Senegal, Yamoussoukro and Abidjan in Ivory Coast. Risks of climate change in international food systems will also be studied through the case of fruits & vegetables imported to the UK. SAFOODS' original approach is to work downstream to upstream, starting from urban consumers' diets, then tracing back to the production areas. This includes mapping of food chains, and identifying critical points where climate change may threaten production flows and increase food loss and waste. Using mixed methods (focus groups, surveys, maps, food chains and food systems analysis, simulations with quantitative models, foresights with actors) outputs will include prediction models, identification of innovations, capacity building, and the inclusion of an overall shared vision with various actors of city-region to strengthen food systems for the future.

COORDINATOR CONTACT

Dr. Arlène Alpha

French Agricultural Research Centre for International Development (CIRAD) – France

DURATION
01/07/2021 – 30/06/2024

TOTAL GRANT
€ 515.300

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555

FOSC

ERA-NET Cofund on
Food Systems and Climate

Colophon

Brochure writer: Nikki De Clercq (EV-ILVO) and Martine Vernooij (WUR)

Editor: Christine Bunthof (WUR)

Design: Martine Vernooij and Nikki De Clercq

Published by: FOSC Communication Office - Wageningen University and Research, the Netherlands

FOSC coordination: French National Research Agency (ANR), France

FOSC call office: Federal Office for Agriculture and Food, (BLE) Germany

Contact: info.fosc@wur.nl

Website: www.foscera.net

www.linkedin.com/in/food-systems-and-climate-fosc/

@foscera

subscribe to our newsletter

Images from: https://pixabay.com/
https://www.shutterstock.com/
BIO-BELIEF - Alessia Losa; CRRIsP - Elmar Schulte-Geldermann;
C4C - Giuseppe Leonardo Rotino; CHIAM – DeKUT; CREATE - Omar Khalid;
PHEALING - Ima Zinuddin; TRUSTFARM - Abdelali Laamari; SAFOODS - Raphael Belmin

FOSC is built upon and supported by the experience from FACCE-JPI and LEAP-AGRI

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555