R&I ANALYSIS REPORT

Achievements of EU Research, Innovation and Development projects in the last 10 years to address the global challenge of agriculture transformation

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Portfolio Analysis of EU-funded projects

Independent Expert Report by Prof. Vladislav Popov and Prof. Isabel Medina, in collaboration with experts from the SCAR ARCH Strategic Working Group

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Abbreviations

CARPS	Community Action Research Platforms
DeSIRA	Development Smart Innovation through Research in Agriculture
EC	European Commission
ERA	European Research Area
EU	European Union
DG INTPA	Directorate-General for International Partnerships
DG RTD	Directorate-General for Research and Innovation
FAO	Food and Agriculture Organisation of the United Nations
FNSSA	Food and Nutrition Security and Sustainable Agriculture
FS	Food System(s)
FVC	Food Value Chains
GFAR	Global Forum on Agricultural Research and Innovation
ICT	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
LEAP-Agri	Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable Agriculture
LMIC	Low-Middle Income Countries
MEL	Monitoring, Evaluation and Learning
NGO	Non-Governmental Organisation
PA	Portfolio Analysis
R&I	Research and Innovation
SCAR	Standing Committee on Agriculture Research
SDG	Sustainable Development Goals of the United Nations
SFS	Sustainable Food System(s)
SME	Small and Medium Enterprises
SWG	Strategic Working Group

SWG ARCH	Strategic Working Group "European Agricultural Research towards greater impact on global Challenges" (ARCH)
SWOT	Strengths, Weaknesses, Opportunities and Threats
ToR	Terms of Reference
WG	Working Group

1. Executive Summary

The RefreSCAR Horizon Europe project aims to improve the coordination of national and European bioeconomy research and innovation programmes within the European Research Area (ERA) by strengthening the Standing Committee of Agriculture Research Working Groups (SCAR WGs). As part of this initiative, the SCAR Strategic Working Group on European Agricultural Research towards greater impact on Global Challenges (SWG ARCH) commissioned a Portfolio Analysis (PA) to evaluate the achievements of European Union (EU) funded research, innovation, and development projects aimed at transforming the agri-food systems towards sustainability in low- and middle-income countries (LMIC). Through a structured evaluation of EU-funded projects over the past decade, the PA delivers a comprehensive and strategic overview that captures the strengths, weaknesses, needs, and gaps identified across these initiatives. It critically assesses the outcomes and impacts achieved in research and international partnerships for enhanced food system sustainability beyond the EU over the last ten years.

The analysis focused on projects funded by Directorate-General for Research and Innovation (DG RTD) and Directorate-General for International Partnerships (DG INTPA), often in collaboration with international organisations such as the Food and Agriculture Organisation of the United Nations (FAO) and national research agencies. The evaluation criteria have included project scope, consortium structure, geographical intervention areas outside the EU, and the expected outcomes and impacts on local food security and nutrition.

Regarding the methodological approach, the PA followed a structured, three-phase process:

- **Preparatory (inception) phase:** clarifying the request for the PA, the scope and methodology, expected outcomes, coordination process, responsibilities and reporting.
- **Phase I:** Screening and selection of 30 projects with an international dimension, evaluating their scope, consortium composition, geographical reach, and relevance to agri-food system transformation.
- **Phase II:** In-depth analysis of 15 selected projects, assessing their activities, results, achievements, research advancements, and current impacts on transforming agri-food systems outside the EU.

The 15 projects were categorised into four thematic clusters that were extensively analysed:

- **Cluster 1:** Sustainable intensification of agri-food systems;
- **Cluster 2:** Agri-food systems for nutrition and healthy lives;
- **Cluster 3:** Multisectoral approaches (food security, nutrition, social aspects, water management), including expansion and improvement of agri-markets and trade;
- **Cluster 4:** Knowledge systems, policy, and decision-making.

The PA revealed key weaknesses, gaps, and needs, highlighting the main lessons to be learned. The identified needs emphasise the importance of enhanced policy alignment, stronger local market development, and more effective integration of digital solutions. Addressing these areas

will ensure that future EU-funded projects achieve greater impact and foster sustainable and resilient agri-food systems, specifically:

- Digital tools and technologies remain underutilised, limiting data collection, monitoring, and informed decision-making.
- The absence of standardised regulatory frameworks, support services and quality control measures hinders consistency and scalability.
- Greater investment in infrastructure and local market development is essential to boost the scalability and the long-term sustainability of project outcomes.
- Consistent long-term engagement with local stakeholders and raising their capacities to co-construct and implement the Research and Innovation (R&I) advancements is critical to keep project benefits post-completion.
- Aligning project goals with national policies and development plans enhances systemic agricultural transformation.

The projects have had a significant impact on advancing national and regional R&I ecosystems and in providing novel business models for the local communities. The engagement of local and regional communities through capacity-building programmes and collaborative workshops has strengthened local ownership and knowledge dissemination. Interdisciplinary and multi-actor approaches have fostered effective collaboration between research institutions, policymakers, and local stakeholders. Notably, the promotion and reinforcement of local research, along with the collaboration with European researchers, will have medium and long-term impacts on regional development. In this regard, the projects have successfully targeted the third countries' policies thus reflecting the EU's commitment to fostering global agricultural transformation.

The analysis evidenced the positive effects of the projects in addressing complex challenges such as climate change, socio-economic risks and enrolling local actors and communities to move towards resilient and sustainable agri-food systems. In particular, the projects delivered technologically innovative solutions to promote sustainable agricultural practices, a rational use and management of natural resources and improve the entire food production chain. They afforded tools to enhance food security and promote sustainable nutrition while strengthening resilience against internal and external risks. Overall, the analysed projects successfully achieved most of their goals despite several external challenges such as management delays on the consortia agreements, contract signatures, funding provision by some of the funding organisations and especially problems related to the COVID-19 pandemic.

The PA also provided a set of evidence and suggestions for future policy briefs targeting European Commission (EC) policymakers. It highlights the importance, achievements, and potential future directions of EU agriculture R&I efforts addressing the global transformation of agri-food systems. The main recommendations for the future programme can be summarised as follows:

- Strengthen the integration of digital technologies for enhanced data-driven decision-making and monitoring.

- Develop and enforce standardised regulatory frameworks and quality control measures across regions.
- Increase investment in local infrastructure and market development through integration in research infrastructure networks to ensure the scalability and sustainability of outcomes.
- Foster long-term partnerships with local stakeholders to maintain and build on project impacts.
- Align future projects with national and regional policies to maximise their relevance and effectiveness.

In conclusion, the PA provided strategic insights for shaping future EU agriculture R&I programmes, emphasising the importance of international partnerships, interdisciplinary collaboration, and policy support for sustainable agri-food system transformation. The recommendations formulated as a result of the PA could guide the next round of financing and the development of impactful, globally relevant research and innovation initiatives.

2. Introduction

The SCAR advises the EC, EU Member States and Associated Countries on R&I priorities to address Europe's challenges in agriculture, fisheries, food systems, forestry, and the wider bioeconomy. SCAR co-creates impactful R&I strategies, working closely with the European Commission.

The Horizon Europe project RefreSCAR (https://www.scar-europe.org/refrescar) provides support to the Working Groups and Task Forces of SCAR, aiming for an "Improved coordination of national and European bioeconomy research and innovation programmes in the European Research Area (ERA) through strengthened SCAR Working Groups".

Within the framework of the RefreSCAR project, the SCAR ARCH SWG on European Agricultural Research towards greater impact on global Challenges requested a Portfolio Analysis on the achievements of EU R&I projects undertaken in the last 10 years with a clear international dimension to tackle the agri-food system transformation in low and middle-income countries. This PA aimed to provide a critical review on the projects conducted at international level and funded by the EU in the food system transformation area. The focus was on actions beyond Europe, particularly on the demand side, and to reveal the research and innovation needs and gaps.

In the first phase, the PA includes an overview of those relevant projects with an international dimension, which were funded by DG RTD or DG INTPA (added by national funding) in the last 10 years. The analysis considerers the project scope, consortium typology, geographical area of intervention outside the EU and expected outcomes and impacts. In the second phase of the PA, a deep assessment of fifteen selected projects was performed reviewing the gaps, threats, and revealing the lessons to be learned and addressing a series of recommendations for future investments.

The analysis included an overview and assessment of the EU funded projects regarding their contribution to the following sub-objectives:

- Addressing key challenges and problems to promote Food and Nutrition Security and Sustainable Agriculture (FNSSA) with climate change perspective.
- Designing and monitoring an impact pathway approach based on a plausible theory of change.
- Implementing a multi-stakeholder approach mobilising farmers, private sector, public sector, civil society and researchers to promote innovation processes.
- Joint designing of innovation with local actors based on science and other source of knowledge to change behaviours, skills and agricultural/managerial practices.
- Strengthening innovation support services including advisory services.

The PA investigation used a desk-study approach, where relevant public sources of information were identified and exploited such as the EU databases of the Community Research and Development Information Service (CORDIS), Development Smart Innovation through Research in Agriculture (DeSIRA), Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable Agriculture (LEAP-AGRI), FAO and Capacity4Dev. In addition to the available public data, the authors attempted to perform an online survey with the coordinators of the 15 selected project (see Step 2 in Annex 1 of this report). The questionnaire contained questions, which were important for identifying the key achievements as well as the R&I gaps and needs during the projects' execution and upon the projects' completion. The questionnaire was sent on December 2024 to the coordinators, but there was a negligible coordinators' response and therefore, the PA investigations and analyses continued based solely on the identified publicly available sources.

The projects addressed topics which are important for the targeted countries such as: diversified cropping systems with a value chain perspective (including genetics and control of pests and diseases), agroecology and sustainable intensification (including agroforestry), livestock management with a territorial and value chain perspective, sustainable resources management (including water, energy, forest), improved nutrition, sustainable diets and food security, strengthening of innovation support services and innovation policies.

Overall, the PA report aims to provide strategic recommendations to inform future EU R&I programmes. By identifying both the successes and shortcomings of current initiatives, the PA endeavours to guide the next round of funding toward even more impactful, globally relevant, and sustainable research and innovation efforts. The report also provides an overview of the selected projects and reveals R&I needs/gaps and recommendations identified based on the projects' findings.

3. Methodology for monitoring and analysis

The Portfolio Analysis followed three major phases:

- **Preparatory (inception) phase:** clarifying the request for the PA, the scope and methodology, expected outcomes, coordination process, responsibilities and reporting.
- **Phase 1:** A systematic process of selecting 30 relevant projects having an international dimension, and funded either by DG RTD or DG INTPA in the last 10 years (review of project scope, consortium typology, geographical area of intervention outside the EU, expected outcomes and impacts) and a thorough analysis of their content.
- **Phase 2:** Identification and in-depth analysis of the 15 most relevant projects in terms of their actual impacts on the transformation of the agri-food systems outside the EU, their positive synergistic effect and potentially their leverage effect. The PA also integrates and synthesises developments, gaps, overlaps and trends in state-of-the-art knowledge and innovation, and the potential impact on policy.

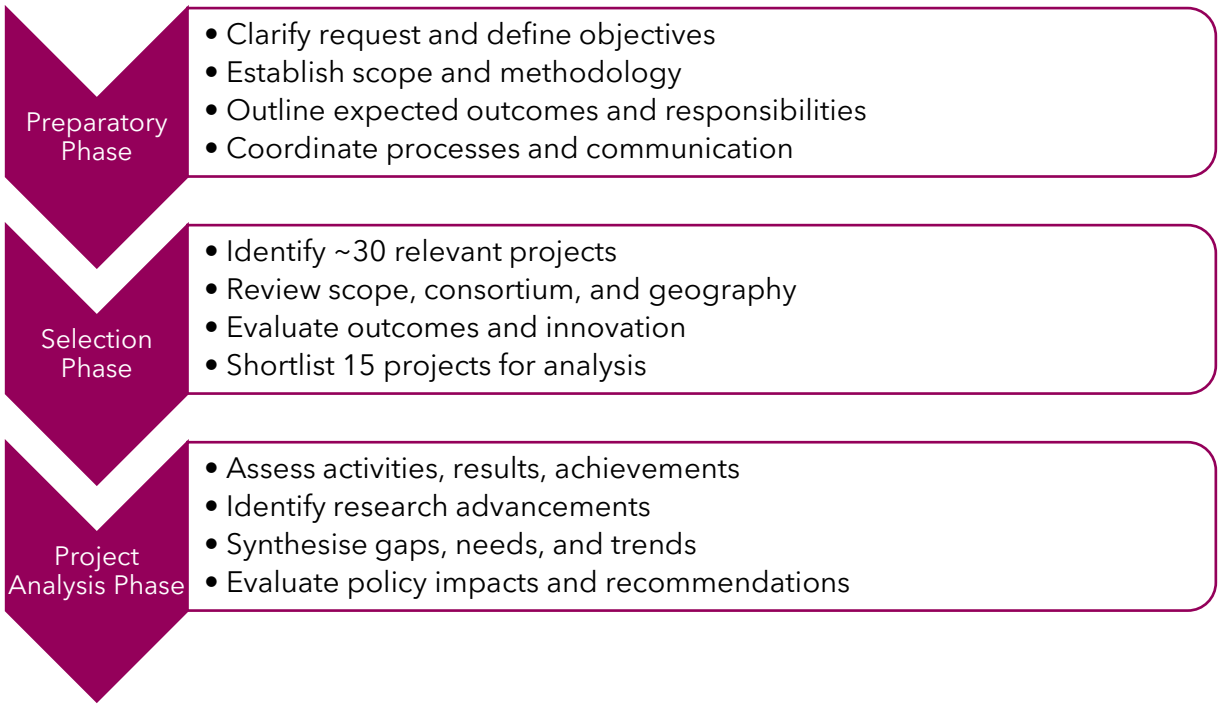

Figure 1: Workflow Diagram: Phases of the Portfolio Analysis (PA) Report

Figure 1 maps out the three phases of the Portfolio Analysis, ensuring a systematic and comprehensive evaluation of EU-funded R&I projects.

The **criteria for selection of the projects** for review and analysis (according to the PA Terms of Reference (ToR)) were discussed and agreed around the following:

- Scope of the projects in the agri-food systems domain.
- Strong scientific and practical results.
- Co-creation of the research objectives and of the research work from the start until the final outputs.
- European collaboration or a local/regional place-based innovative approach.

- Relevant R&I projects (from basic to finalised), completed in the last 10 years (2014-2024) and related to the continuum "research-innovation-impact-capacity building" with an international dimension (e.g. the composition of the consortium).
- (Co)funded by DG RTD (Horizon 2020 then Horizon Europe), DG INTPA (for instance the DeSIRA projects) or any other EU funding authority.
- Focus on the transformation of agri-food systems for greater sustainability beyond Europe (from primary production to diets).
- International dimension, e.g. all geographical areas considered with a special attention to the strategic partnerships of the EU (e.g. Africa, Mediterranean, Latin America) and the low- and middle-income countries (projects addressing issues only within the boundaries of the EU27 are excluded).
- Interdisciplinarity, transdisciplinary and multi-actor approaches with innovation component.

The analysis has been carried out by two independent experts whose work has resulted in the following sections of this report. The investigation used a desk-study approach, where relevant public sources of information were identified and exploited such as the EU databases of CORDIS, DeSIRA, LEAP-AGRI, FAO and Capacity4Dev.

In addition to the available public data, the authors decided to perform an online survey with the coordinators of the 15 selected project (see Step 2 in Annex 1 to this report). The questionnaire contained questions, which were important for identifying the key achievements as well as the R&I gaps and needs during the projects' execution and upon the projects' completion. Unfortunately, there was no response from the project coordinators and therefore, the PA investigations and analyses continued solely based on the identified publicly available sources.

4. Analysis of the selected projects

4.1 List of 15 in-depth analysed projects

Below are the 15 EU-funded projects selected for an in-depth analysis (Table 1). All 15 projects met all the selection criteria described previously.

Table 1: Selected 15 EU-funded projects for an in-depth analysis (further details in Table 3)

Project Title	Acronym
Edible Cities Network Integrating Edible City Solutions for social resilient and sustainably productive cities	EdiCitNet
DevelopMent AnD application of integrated technological and management solutions FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries	MADFORWATER
Small Fish and Food Security: Towards innovative integration of fish in African food systems to improve nutrition	SMALLFISHFOOD
Developing capacities in Agricultural Innovation Systems: scaling up the Tropical Agriculture Platform Framework	TAP-AIS
Understanding food value chains and network dynamics	VALUMICS
Innovative approaches to value-addition and commercialisation of climate-smart crops for enhanced food security and nutrition in Africa and beyond	NUTRIFOODS
Co-innovations across scales to enhance sustainable intensification, resilience, and food and nutritional security in water-managed agricultural systems in West Africa	WAGRINNOVA
University-based Community Action Research for increasing viability of cereal-legume value chains towards improved nutrition and livelihoods in sub-Sahara Africa	UnicARSSA
Capacity Development for Agricultural Innovation Systems	CDAIS
West African Breeding networks and Extension Empowerment	ABEE
Promote ecological intensification and inclusive value chains for sustainable African milk sourcing	AFRICA-MILK
Adapted Agroforestry Systems for the Central American Dry Corridor	AGRO-INNOVA
Agricultural Trade and Market Access for Food Security: Micro- and Macro-level Insights for Africa	ATMA4FS

Enhancing food and nutrition security through promotion of edible insects value chain in Eastern Africa	Ento-Economy
Locally-driven co-development of plant-based value chains towards more sustainable African food system with healthier diets and export potential	InnoFoodAfrica

To make the analysis more structured, all selected 15 projects were grouped into **four thematic clusters as shown in Table 2** (see Annex 1 for more details) based on their profile and scope, i.e.:

1. Sustainable intensification of agricultural/food systems;
2. Agri-food systems for nutrition;
3. Multisectoral approaches (food security & nutrition, social, knowledge, cities, water management, etc.), including expansion and improvement of agri-markets and trade;
4. Knowledge system, policy and decision-making.

The clusters' grouping was done considering the scope of the projects in the agri-food systems domain.

Table 2: Clustering of the 15 selected EU-funded projects for an in-depth analysis based on their profile and scope

Profile and scope	Cluster 1. Sustainable intensification of agricultural/food systems	Cluster 2. Agri-food systems for nutrition	Cluster 3. Multisectoral approaches, incl. expansion and improvement of agri-markets and trade	Cluster 4. Knowledge system, policy and decision-making
Project acronym	ABEE AGRO-INNOVA Ento-Economy UnicARSSA	AFRICA-MILK InnoFoodAfrica SmallFishFood	ATMA4FS EdiCitNet MADFORWATER NUTRIFOODS WAGRINNOVA	CDAIS TAP-AIS VALUMICS

4.2 Projects' assessment

4.2.1. Geographical coverage and categorisation of the projects

The fifteen projects considered involved collaboration between 17 partners in Africa, nine Latin American countries, six countries in Asia and 20 European countries (Fig. 2 and Fig. 3).

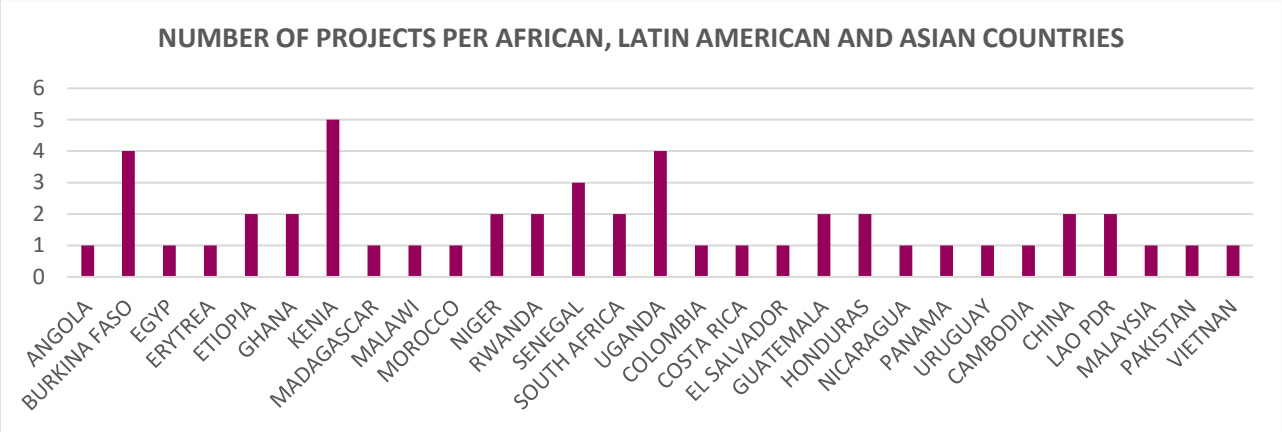

Figure 2: Participation of the analysed targeted countries in the 15 projects (Image by the authors)

A majority of the projects are in Africa and cover more than one location. A majority of them were funded under the LEAP-Agri framework which required collaboration amongst at least two African and two European countries. East and West Africa were the predominant locations for most of the projects. Partners from Burkina Faso, Kenya and Uganda participated in the highest number of projects in Africa, followed by Senegal. As for Latin American countries, those from Central America were predominant, while South American countries were scarcely involved. China and Laos were the main Asian countries involved, though their participation was far from matching the dominance of African partners. Several consortia include the African research organisations: ISRA, INERA, UoN and FIFAMANOR.

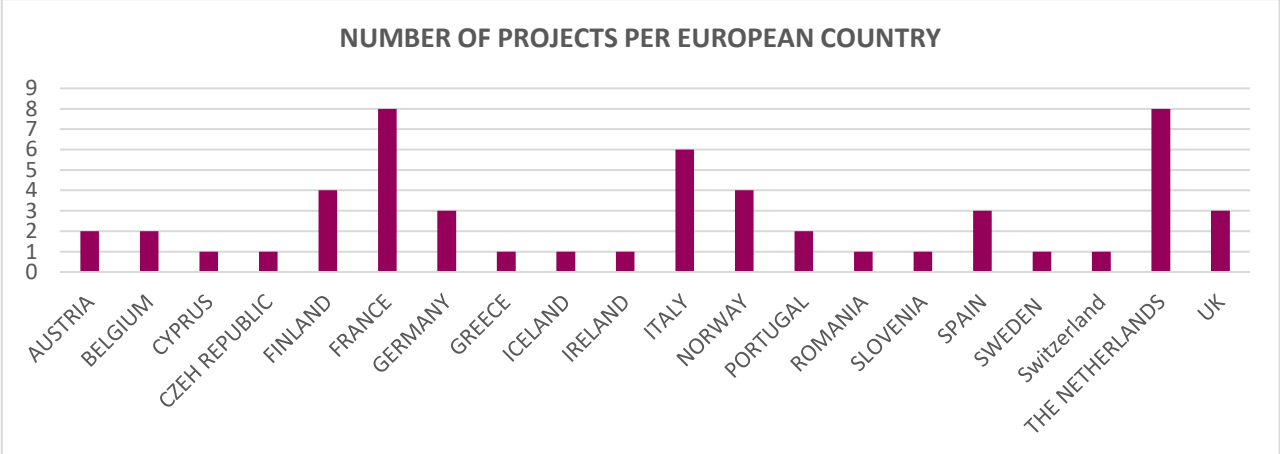

Figure 3: The number of projects per European country in the 15 projects (Image by the authors)

As for European countries, European export markets were highly implicated. The Netherlands and France were involved in the highest number of projects followed by Italy, Norway and Finland. Nine of the 20 European countries had three or more projects each, also reflecting a high level of concentration of projects in some countries. The distribution of projects amongst European countries confirms a higher number of projects from Western European countries, and limited participation of Eastern European countries.

Financial distribution of projects. Table 3 shows a summary-style breakdown of the reported total budget and EU contribution where available, alongside the key countries/regions to implement the project or to be affiliated (see also Annex 2). The analysis, though, relies on open public sources of data as the missing data on the project budgets could not be obtained.

Table 3. Projects and funding breakdown per project consortium (Image by the authors, based on the available open sources data)

Cluster	Project Name	Programme	Total Budget (€)	No. Partners	EU Contribution (€)	Countries Involved	No. of LMIC partners and % of Net EU contribution	No. of SME and % of net EU contribution
1	**ABEE**	DeSIRA	8,771,930	9	8,000,000 (91%)	Burkina Faso, Niger, Senegal	8 (87%)	0
1	**AGRO INNOVA**	DeSIRA	6,600,000	16	6,000,000 (91%)	Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama	16 (100%)	4 (-%)
1	**Ento-Economy**	Leap-AGRI	611,500	4	183,500 (30%)	Kenya, Uganda	2 (46%)	0
1	**UnicARSSA**	Leap-AGRI	393,800	4	118,000 (30%)	Sub-Saharan Africa	2 (46%)	0
2	**AFRICA-MILK**	Leap-AGRI	1,549,100	6	464,730 (30%)	Senegal, Burkina Faso, Kenya, Madagascar	4 (-%)	0
2	**InnoFood Africa**	H2020	6,465,894	9	6,465,894 (100%)	Ethiopia, Kenya, South Africa, Uganda	4 (38%)	2 (1.6%)
2	**SmallFish Food**	Leap-AGRI	1,000,000	8	300,000 (30%)	Norway, Netherlands, Germany, Ghana, Kenya, Uganda	4 (8%)	0
3	**ATMA4FS**	Leap-AGRI	1,000,095	6	300,028 (30%)	Africa, EU partners	2 (22%)	0
3	**EdiCitNet**	H2020	11,763,163	32	11,254,913 (96%)	Germany, Central America, Africa, East Asia	3 (-%)	12 (-%)
3	**MADFOR WATER**	H2020	3,722,169	19	2,910,000 (78%)	Egypt, Morocco, Tunisia, EU countries	4 (21%)	2 (11%)

Cluster	Project Name	Programme	Total Budget (€)	No. Partners	EU Contribution (€)	Countries Involved	No. of LMIC partners and % of Net EU contribution	No. of SME and % of net EU contribution
3	**NUTRI-FOODS**	Leap-AGRI	1,001,000	9	300,000 (30%)	Africa, Europe (CSFC value chain)	5 (29%)	4 (0%)
3	**WAGRIN-NOVA**	Leap-AGRI	1,105,880	15	332,000 (30%)	West Africa, Europe	5 (31%)	0
4	**CDAIS**	Capacity4 dev	13,356,851	34	12,000,000 (89%)	Multiple countries globally	29 (-%)	0
4	**TAP-AIS**	DeSIRA	5,000,000	9	5,000,000 (100%)	Africa, Latin America, Asia-Pacific, multiple EU partners	5 (-%)	0
4	**VALUMICS**	H2020	6,302,423	20	5,974,000 (95%)	19 EU partners across 14 countries, plus 2 Asian partners	2 (1%)	2 (29%)

Across the four clusters, the EU net contribution was rather homogeneous (87% of the total budget with a minimum of 80% and a maximum of 93%). The average EU contribution per project was around 4,000,000 €, but the EU support per project for cluster 4 ("Policy") was significantly higher (5.7 M€), while this support was significantly lower (2.4 M€) for projects in cluster 2 ("Nutrition"). The relative number of partners from LMIC in the 15 projects was 48% on average, with a peak at 85% in projects of Cluster 1 ("Intensification") and a minimum of 24% in projects of Cluster 3 ("Multisector and trade"). Around 40% of the EU contribution to the 15 projects went to partners from LMIC. The relative number of private actors in the 15 projects was 13%, with as expected, a peak at 22% in Cluster 3 and a minimum of 3% in Cluster 4. The significant financial EU contribution to the target projects in all the four thematic clusters of the EU interest was proven crucial for the generated impact.

4.2.2. Projects' activities, outcomes and goals

This section of the report summarises the research and innovation advances and goals accomplished, major benefits associated and the positive effects at the international, national and regional level. The results are presented according to the four different thematic clusters in which the 15 selected projects have been grouped.

The evaluation of the project development was done based on the responses to the following questions:

1.	*Has the project achieved its objectives and promised results e.g. technological, social, environmental and economic outputs, outcomes and impacts?*
2.	*What were the major R&I advancements related to the major research component (from basic to finalised), innovation, capacity building, interdisciplinarity, transdisciplinarity and multi-actor engagement?*
3.	*What were the major technological, economic, environmental and social benefits delivered to stakeholders, and will they be sustainable upon the project exit?*
4.	*Has a synergistic effect at international, national and regional level and potential leverage effects been achieved?*

I. Cluster 1 - Sustainable intensification of agricultural/food systems

The projects analysed here are **Ento-Economy, UnicARSSA, ABEE** and **AGRO-INNOVA**.

The type of activities was very diverse, especially those performed at national/local level. The approaches were holistic and striving to address logically connected food system (FS) components, e.g. sustainable agriculture production, nutrition for vulnerable groups, market improvements. Communication and capacity building was at the focus through workshops with the local/national stakeholders, field sessions and demonstration plots, focus group discussions, training sessions, cooking competitions, exhibitions in trade fairs, etc. The activities at international level were mainly scientific conferences or workshops, to show the results of the projects' research in oral or poster presentations. Many of these activities were hybrid (physically - online), while the dissemination was only in on-line mode (social networks, on-line newsletters and information included in the projects' websites).

Completion of the project objectives

The projects successfully contributed to the initially set objectives in, e.g. (i) increasing agricultural productivity and thus improved livelihoods, (ii) diversifying their cropping systems and thus improving nutrition and also increasing the resilience of the agro-systems to the effects of climate change and (iii) capacity building of communities and creation of stable linkages between the community and relevant stakeholders. Strengthening of these value chains was critical. Small producers are willing to access, adopt and use new, more efficient crop varieties, which meet local needs and market demand. Certain innovations added to sustainability, for instance, malnutrition and developing sustainable insect-based value chains by direct consumption or indirectly as feed for domestic animals for improved food and nutrition security in Kenya and Uganda (Ento-Economy). Other examples are the implementation of 23 agroforestry models adapted to the climate changes in the Central American Dry Corridor (AGRO-INNOVA), bio-input production, soil management and conservation, crop intensification, plant genetic material propagation,

productive forest diversification, animal genetic improvement, post-harvest management and food conservation, and the implementation of small-scale water harvesting and irrigation systems.

National and regional collaborations were crucial for project success and long-term impacts, e.g. with the National Centres of Specialisation and the Regional Centres of Excellence. Physical or electronic platforms for participatory action and academic research and capacity building were a useful instrument to explore.

Transdisciplinary research was focused on improved productivity, soil nutrient-use efficiency, enhanced value chain operations and reduced post-harvest losses in smallholder agriculture. In addition, improved nutritional contribution of cereals and legumes contributed to improved livelihoods, rural incomes and Food and Nutrition Security (FNS), whilst strengthening capacities and improving the relevance and contribution of universities to achieving the EU and United Nations Sustainable Development Goals (SDGs). Interdisciplinary, transdisciplinary and multi-actor approach is comprising many geographical low and middle income African, Asian and Latin America countries.

R&I advancements

Innovative value chains for sustainable production of staple crops were tested and demonstrated, including among others soil-enhancing technologies, diversified and resilient cereal-legume cropping, strengthening, upgrading and validating existing crop breeding programmes, etc. They were linked to the nutrient requirements of local communities (e.g. young children) and their nutritional diets. Other advancements included; development of a tool for tracking and monitoring the adoption of innovations and impact of the project in the targeted African Region. Other achievements were the dissemination of the potential of remote sensing and geospatial analysis with the Observatory and the Copernicus and Galileo programmes focused on agriculture, and the development of an Innovation Hub tool to manage all the information generated in the region. Some outputs on the value chain mapping and analysis indicate that for target staple crops, utilisation, marketing and gender dynamics play an important role in the effectiveness/efficiency of the value chain. Development of an artificial intelligent-based approach to deter birds from infesting cereals in cereal crop fields reduced losses and contributed to improved yields. A detailed household economy analysis was undertaken to estimate the contribution of cereals and legumes to household food and nutrition security and incomes. Thresholds of household resilience to climate shocks such as drought and floods were estimated.

Benefits to stakeholders

Findings were disseminated to policy makers and research entities to design interventions and programmes of local communities (e.g. on sustainable production of cereals and legumes which constitute the main diet of the project communities).

Promising technologies for increasing agricultural productivity were tested on farmer managed demonstrations. An intensive capacity building programme was executed to farmers, their

associations and other value chain actors on a range of topics including postharvest handling, value addition and marketing, and agribusiness. It was designed to support local communities to increase their production through integrated soil and water management and climate smart agronomic practices for cereals and legumes. Through digital skills training, the projects included in this group enhanced farmers' access to knowledge, market intelligence and other associated digital services.

The projects in the cluster have enabled producers and national strategic partners to play a central role by contributing technological solutions in African food systems and involving producer organisations across more than 100 rural communities affected. Dissemination of gender and youth-focused instruments and mechanisms, such as the "Women Empowering Women" programme and gender equality training strategies has been important for reintegrating rural women and youth into rural economies.

Others key actions included strengthening the capacity of local value chains in entrepreneurship and innovation, linking them to local markets for nutritious products and establishing multi-stakeholder alliances.

Synergistic effect at various levels

Supporting farmers and value chain actors to access appropriate technologies was highlighted, specifically, access to information (e.g. maintaining soil fertility), access to markets of the target crops, linkages of farmers to relevant stakeholders, e.g markets, microfinance, access to ICT for agriculture, i.e. the designed artificial intelligent-based approaches.

Community engagement links smallholders and rural entrepreneurs directly with universities in platforms (e.g. community action research platforms (CARPS) for action to share currently available technologies, adapt them to local conditions and encourage new research for key constraints).

Capacity building of over 500 smallholders trained in adapted production technologies was observed; some farmer groups started to supply Small and Medium Enterprises (SMEs) (e.g. EASTCOM Foods), thus building trust for a steady supply of raw materials for value added products made from staple crops. The projects executed PhD programmes in, e.g. AI tools and integrating farmer tacit knowledge into the extension systems, plus training graduate and undergraduate students.

The objectives of the projects were aligned with the priorities of the National Development Plans in the targeted countries.

II. Cluster 2 - Agri-food systems for nutrition

The projects analysed here are **InnoFoodAfrica**, **AFRICA-MILK** and **SmallFishFood**.

The projects address an important gap in the global discourse on food security that is the sufficiency of nutritive food for the African people. They remark on the importance of achieving a

sustainable nutrition for the population through the development of affordable, nutritive and healthy food products.

Completion of the project objectives

The three projects are aimed to address the nutritional needs of millions of Africans by focusing on the sustainable production of foods with an important nutrient content and a healthy dietary role as fish, milk and plant-based products. They advocate for the transformation of these food systems, from primary production in the field or in the sea, all the way to improved diets. They have developed food products with nutrients which can play a significant role in combating the triple burden of hunger, micronutrient deficiencies and non-communicable diseases and brought to market.

The three projects have implemented a holistic approach considering the socio-cultural, economic, and institutional changes alongside technical and infrastructural innovations. Among the key innovations are protocols aimed to the diversification and standardisation of fresh and processed products. InnoAfrica has improved seed varieties to enhanced yield and productivity, along with comprehensive training on best practices in farming and seed management. Africa-Milk has scaled up functional multiservice collection centre models and dairy processing units to increase and secure local milk sourcing, considering the potential of ecological intensification of milk production and the development of inclusive milksheds. Smallfish has implemented measures for value addition and longer shelf life of fish products, technical improvements of processing and packaging and improved handing along the value chain.

R&I advancements

The results of the projects have contributed to increased productivity, extended shelf-life and improved safety handling along the food value chain for fish, milk and crops. Research stressed the nutritional value and healthy properties of animal products, thereby promoting socially and environmentally responsible consumption.

Through research actions, producers have increased their innovation capacity to develop intensive yet ecological farming practices and sustainable fishing systems. Significant efforts were made across the three projects to develop new commodities, and improved post-harvest processing methods, all while keeping the technology at an affordable level. Remarkably, the projects in this cluster have promoted and scaled up models of techno-economic entities to improve the productivity of animal production systems, both dairy and animal-based foods. This includes livestock feed and veterinary services, dairy farm and fishery processing plant models. Technology adaptation was combined with training and communication activities to support better farming practices, healthier nutrition and training and equipment of technical staff.

Also noteworthy are the advances towards the conservation and the characterisation of the genetic resources and the biological bases (genetic, epigenetic and molecular) that determine the efficiency and resilience of plant and animal species. The projects have also generated a large

set of data that have improved the knowledge on quantities, values, losses and labour involvement in the value chain of crops, milk and small fish production. They have generated a better database for risk assessments and risk-benefit-analysis indicators, stimulated improved awareness of the importance of investment in infrastructure to enable further food quality enhancement.

Market studies and **value chain analysis** have provided relevant insights to better assess the nutritional value, perform risk assessments and risk-benefit analysis. Moreover, **consumer studies** evidenced the nutritional needs of vulnerable groups (small children and women of reproductive age). The work done allowed to identify the key factors for consumer food choice motives and attitudes towards the food products, helping to create channels for driving consumers to much better healthy food choices.

Benefits to stakeholders

Stakeholders have implemented efficient and inclusive food trade systems affording and assuring quality and safety of food. The projects have provided models for the development of local food markets, promoting an environment favourable to the development of the local food sectors. They have stimulated public policy measures favourable to the development of private entrepreneurship in the local milk, fish and crop sector. For milk and dairy products, processing unit and functional multiservice collection centre models are scaled up in a dynamic of diversification, standardisation and standardisation of processed products.

The projects have disseminated vocational skills for better food handling and post-processing, developing new product commodities and possibilities of entrepreneurship.

The projects have provided higher awareness for the nutritive role of milk, fish species and new crops by researchers, traders and agencies. They also highlighted the significance of product labelling and declaration together with the need for further analysis taking account of future updates of food composition tables.

The overall results contribute to reduced malnutrition and micronutrient deficiency. This relevant goal addresses improved health conditions for vulnerable social targets as cognitive development and immune systems for infants, and improved public health for pregnant women and low-income population.

In terms of social findings, they improved knowledge and awareness of the constraints women face in these food channels.

Synergistic effect at various levels

The projects have contributed to the policy goals of poverty alleviation, food system stability and the prevention of environmental degradation in building poverty- and nutrition-sensitive management systems for African food changes. They have contributed to better management of milk, fish and crop food chains by local and government institutions. The African innovation

platform (https://africainnovationplatform.com/) developed by InnoFoodAfrica addresses the promotion of innovative solutions in Africa by engaging local, national and international stakeholders for widespread technology and knowledge transfer has been developed. The platform aims to provide peer support for small farmers and SMEs, to enable compliance market and supply chain demands and maintenance of quality control parameters. The platform is a key exchange point to share best practices and innovative solutions among African stakeholders, contributing to the wider objective of the EU/Africa FNSSA partnership. Due to strong interaction with FAO and WordlFish, small fish are increasingly recognised as an important issue; nutritional data of small fish are in process to be included into FAO databases.

III. Cluster 3 - Multisectoral approaches (e.g. food security & nutrition, social, knowledge, cities, water management) including expansion and improvement of agri-markets and trade

The projects included in this cluster are **NUTRIFOODS, EdiCitNet, MADFORWATER**, **WAGRINNOVA** and **ATMA4FS**.

The projects addressed the key barriers of the African agri-food system, i.e. low productivity, hard management of water sources, and limited access to urban and international markets, affordability and convenience of the local foodstuffs. The projects have provided a better preparedness in Africa to address water and climate change vulnerabilities, better monitoring and forecasting tools. The systemic use of urban landscapes for food production is a major step towards more sustainable, liveable and healthier cities. Significant efforts have focused the analysis for expanding local, regional and international trade and market access.

Completion of the project objectives

The projects have implemented technological measures based on the improvement of water management and the promotion of local food systems. For this last goal, they proposed the use of local climate-resilient crops and pursued their consumption in urban scenarios.

To get the real solutions, the projects have applied a multistakeholder and multiscale approach to bring technological solutions that have been tested at lab-scale and then applied at pilot plant and market real scales. The strong engagement between partners in Europe and Africa has been essential to actively exchange, discuss and share research insights, methodologies and protocols.

The NUTRIFOODS provided opportunities to push for an increase in the supply of local climate-resilient crops (sorghum, cowpeas and cassava) as healthy, sustainable and affordable ingredients for food products. The Agricultural Trade and Market Access for Food Security (ATMA4FS) project addressed trade and market access issues in three product categories that are important for current and potential African commerce: fresh fruits and vegetables, grain products as well as meat. MADFORWATER and WAGRINNOVA claimed for the efficient use of water through developing a set of integrated technological and management solutions. These

were aimed to enhance wastewater treatment, treated wastewater reuse for irrigation and water efficiency in agriculture, with a special focus on dry unreliable environments. Edible Cities Network (EdiCitNet) demonstrated that the implementation of non-ornamental green infrastructure in the city allows for an increase in sustainable local food production, and also facilitates the regeneration of urban spaces.

The projects used markets as key incentivising drivers of new value chains and to enhance technology uptake through commercialisation. They pursued adequate and lasting co-design technical and governance solutions responding to local challenges and opportunities.

The results from the ATMA4FS provide evidence that supports the **formulation of targeted policies and programmes**. Furthermore, they point out how to improve market access by identifying which actors along the supply chain should be targeted to minimise the downsides of existing trade barriers, thereby having an impact on the prevalent realities when producing/selling the respective products at the local, regional and/or international market. It suggested a range of opportunities and challenges for expanding local, regional and international trade and for improving access to agri-food markets for different types of actors.

R&I advancements

The projects provided tangible interventions to promote the use of local resources as crops and the management of water, to reduce Africa's dependency to imported raw materials and improve the resilience of the food system. EdiCitNet has systematically explored the wealth and diversity of existing edible cities and has adapted, planned and implemented successfully proven edible cities in their specific urban context.

Projects provided a strong contribution to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters by the combat of desertification, restoration of degraded land and soil, including land affected by desertification, drought and floods, and striving to achieve a land degradation-neutral world. For that, a set of improving structures were developed for maintenance and efficient use of water, including at community level as water pumps for irrigation; solar power irrigation pump, and structures to manage runoff in lowland and organic fertiliser in both.

Multi-actor participatory research was essential in adapting innovations to local needs and preferences as well as in identifying business and development opportunities – such as irrigation-related services (e.g. pumps, systems) and crop diversification (agribusiness). Tools and guidelines were prepared to support the co-innovation process, and targeted stakeholders received training. The co-innovation process led to the co-design of appropriate practices in the context of climate change and food insecurity, and provided the ground for advising farmers, developers, and policymakers. A range of guidelines, tools and methodologies were provided for edible city entrepreneurs and initiatives to support the development and growth of their business or organisation.

NUTRIFOODS identified consumer and market needs for climate-resilient crops-based bread products through a market quick scan. A dedicated Rapid Market Appraisal methodology was developed as an effective instrument for SMEs to perform small scale market research. The work done for crop diversification combined with better water management is expected to improve diet, particularly under irrigation that allows food production, including horticultural crops, all year around.

The findings of ATMA4FS have resulted in high-quality scientific publications some of which are published as journal articles, conference proceedings or under review for potential publication. All can be viewed on the project webpage: https://atma4foodsecurity.org/publications.aspx. In Feyaerts et al (2019), there is a conceptual discussion on the type of linkages between global and local value chains in Africa, and how these depend on crop and value chain characteristics. In Fiankor et al (2019), it is shown that cross-country differences in public food standards decrease trade but increase product prices. In Fiankor et al (2020), it is shown that the trade-reducing burden of these stringent food standards falls disproportionately more on smaller exporters that are mainly in developing countries of Africa.

Benefits to stakeholders

The projects have promoted a strong collaboration between academia and business, which allowed transferring the research results into demonstrated product concepts for companies and led to the first steps in establishing new value chains as well as the implementation and commercialisation of new food products. Local value chain actors (including millers, bakers, street vendors and customers) were targeted to obtain local knowledge and insights for product innovation. This is to ensure that solutions are practical and economically viable to implement in the countries. The new crop raw materials will contribute to enhance the diet of the target populations as celiac populations. The promotion of local foods in EdiCitNet enhanced the green economy in the cities, and provided social cohesion through the creation of jobs, and the integration of the most vulnerable sectors of the population.

Additionally, for MADFORWATER and WAGRINNOVA, the main stakeholders to guarantee the valorisation of the results are the Ministry of Agriculture/Hydraulic issues or the Ministries in charge of the services for irrigated or improved lowland agriculture, through the national and regional offices and especially through the National Agricultural Research Institutions and Extension Services. These actors were actively involved in the multi-actor approach for the Innovation Hubs.

Results were shared with civil agricultural society groups and Non-Governmental Organisations (NGOs) with strong political lobbying capacity. For policymakers, policy briefs to propel irrigation and lowland agriculture development were shared at policymaking level. The knowledge co-creation spirit facilitated practical training, and a large number of dissemination actions were organised targeting main stakeholders. The tools for improving the efficient use of water and other resources like soil and nutrients, make local actors better prepared for crisis. Other potential outcomes include improved wellbeing and more resilient small farmer households and

communities, as well as agricultural water and soil conserved and increased awareness on environmental issues.

Interaction with stakeholders within the ATMA4FS (including private and public sector policy-makers, NGOs, civil society and researchers) in workshops organised in Ghana and the Netherlands proved to be vital. The stakeholders were engaged in discussions on agri-food value chains, market access, and the barriers that inhibit agricultural trade.

Synergistic effect at various levels

The synergy between African and European scientists enriched the research, but even more importantly, the industrial partners involved were especially active and brought European and African business skills, experience, insights and connections and allowed successful demonstration of the results in a wide variety of markets. Additionally, the co-innovation process increased collaboration between European and African partners, and generated knowledge base for developing policies and practices to promote sustainable intensification of irrigated and lowland agriculture.

In this cluster, interactions with other "Non LEAP-Agri" projects were stabilised in the countries where the projects were implemented, like the use of weather services apps. Interactions with WASCAL (West African Science Service Centre on Climate Change and Adapted Land Use) proved to be specifically useful.

The training opportunities developed were relevant to the improvement of nutrition and well-being of the populations in the relevant countries. The education and training experience improve the chances of employment for the individuals. Additionally, the projects focused the education improvement, awareness-raising and human and institutional capacity on climate change mitigation through early warning training on water as a limited resource highlighting the need to use it efficiently. Furthermore, implementation of the results is expected to create many economic opportunities in the supply chain of African crops into urban foods with added value.

Finally, the projects have targeted youth with new technology, e.g. apps, to attract them for innovating and applying new tools, and helped to reduce the proportion of youth not in employment, increasing education and training.

IV. Cluster 4 - Knowledge system, policy and decision-making

The projects included here are **TAP-AIS, VALUMICS** and **CDAIS**.

Completion of the project objectives

The projects in the cluster successfully developed a vision for capacity development in Agricultural Innovation Systems (AIS), based on needs identified by stakeholders in each of the pilot countries. It was used as a basis to develop tailored interventions, and to support informed policy formulation and future investments that can then be scaled out. The projects supported the

establishment of a Tropical Agriculture Platform (TAP) to strengthen capacities to innovate in national agricultural innovation systems in the context of climate-relevant, productive, and sustainable transformation of agriculture and food systems in Africa, Latin America, Asia and Pacific. In addition, the VALUMICS project developed a comprehensive suite of approaches and tools to analyse the structure, dynamics, resilience and impact of food chains on food security, economic development and the environment and to enable decision-makers to evaluate the impact of strategic and operational policies on the sustainability, resilience and integrity of the food value chains.

R&I advancements

The projects explored the impact of public regulations (such as quotas, subsidies and public procurement policies) and private initiatives (including certification, Corporate Social Responsibility, marketing, retailer standards and fair trade), which have shaped these food chains. The aim was to assess the conditions under which these interventions enhance - or fail to enhance - resilience, integrity and sustainability.

The projects provided capacity needs assessment, facilitation and policy dialogues at the three Common Framework levels (niche, organisational, national/enabling environment).

Critical points were identified in the food supply chain where waste occurs most, highlighting areas for targeted waste reduction efforts.

The impact of consumer behaviour was explored, notably how consumer choices contribute to food waste. Informing strategies were developed to promote more sustainable consumption habits.

The results of the research involving Food Value Chain (FVC) stakeholders and experts, emphasise that transformation must be supported by FS actions involving all food value chain actors, from farmers to processors, retailers, and consumers with an emphasis on a wider perspective of food system analysis and policy integration. Food system transformation highly depends on the collaboration and cooperation of FVC actors which is where the issue of fairness plays an important role since actors are less likely to collaborate and coordinate activities when they perceive themselves to be impacted by unfair trading practices.

Benefits to stakeholders

A general analytical framework was designed to help, evaluate and improve the innovation capabilities of individuals or organisations. It was nourished by continuous feedback from lessons learned from national and local actions.

New technologies and strategies to minimise waste, emphasising cost-effective and environmentally beneficial approaches across the FVC, were analysed and evaluated.

Certain modelling results (e.g. in the VALUMICS project) demonstrate that the global market-led scenario has significant socio-economic impacts: a 10-12% reduction in agricultural jobs

compared to current jobs, due to continuing concentration and an increase in the capital intensity of farms; and a risk of income loss for farmers in the absence of compensation, especially because of increased debt levels.

The results of the local policy-led scenario on the two value chains studied support the plausibility of a just food system transition on the production side: agricultural jobs are up 10% compared to the business-as-usual trends, and income is maintained without any major constraints for subsidy levels or prices paid to producers; jobs in the agri-food sector increase by 7%, while offering more diversified and less processed foods. It reveals what kind of policy interventions are needed at three complementary levels to foster changes in (i) consumer demand; (ii) market organisation; (iii) agricultural production.

Synergistic effect at various levels

The CDAIS projects used continuous learning cycles to enhance functional innovation capabilities in Africa, Asia and Central America. In eight pilot countries, CDAIS joined partners and key players to address often identified challenges and opportunities in specific regions or value chains. Together, international, national and local partners developed and implemented capacity development plans for agricultural innovation. In the TAP-AIS, actors of the agricultural innovation systems (government ministries, research institutes, universities, advisory service organisations, farmers' associations, NGOs, and private sector value chain actors and smallholders) were involved. At country level, AIS and capacity needs of selected organisations providing innovation support services were assessed. This led to the development of national roadmaps to strengthen national AIS in support of agrifood system transformation. Capacity development interventions (trainings, coaching sessions, bridging and multi-stakeholders meeting) have been organised or are ongoing. TAP Partners Assembly and TAP Steering Committee (SC) provide guidance and ensure alignment with the TAP Action Plan. Synergies and collaborations with other international organisations and networks, including the International Fund for Agricultural Development (IFAD) and Global Forum on Agricultural Research and Innovation (GFAR) is ensured through the TAP. Several events were executed in 2023-2024 including national policy dialogues (in Eritrea, Malawi, Senegal and Pakistan), marketplace events and Monitoring, Evaluation and Learning (MEL) workshops.

The results have been published and disseminated through scientific publications, international conferences, workshops, and webinars. The outreach and dissemination have raised public awareness of the project via social media campaigns and the project website. The TAP website includes news and publications, the YouTube channel contains videos and webinar recordings, and the most recent activities are on Twitter.

The analysis of projects' activities, results/achievements/outputs, research advancements, and practical (applied) advancements highlights the successes of EU-funded research and innovation initiatives.

4.2.3. Conclusions on the projects' activities, outcomes and goals

Projects' activities: The projects implemented diverse activities and holistic approaches at both national and international levels, aiming to showcase advantages of sustainable agricultural intensification practices, nutrition improvement, and market enhancements. National and local-level activities included capacity-building initiatives such as workshops, field sessions, demonstration plots, and training sessions. Internationally, scientific conferences and hybrid workshops presented research outcomes through oral and poster presentations. Dissemination efforts were often web-based, using social networks and project websites.

Key results and achievements: The projects successfully met their objectives, leading to increased agricultural productivity, improved livelihoods, diversified cropping systems, and enhanced resilience to climate change.

The overall success of the projects involved numerous important efforts and instruments. It is remarkable what the work has done for:

- **Community engagement and capacity building:** These efforts were central to the projects' success. Extensive training programmes empowered the major stakeholders, such as farmers and value chain actors, with skills in post-harvest handling, value addition, agribusiness, and digital literacy (Fig. 4). Collaborative platforms facilitated knowledge sharing among stakeholders, creating strong networks for continuous learning. Digital literacy initiatives empowered local stakeholders to access market intelligence and technical knowledge. Workshops, field sessions, demonstration plots, training sessions, and participatory group discussions, successfully strengthened local ownership and knowledge dissemination, and facilitated practical learning and adoption of sustainable practices.
- **Sustainable agricultural practices and technology dissemination:** The projects achieved increased agricultural productivity through diversified cropping systems and improved soil and water management, enhanced food security and nutrition by promoting high-yield, climate-resilient crops and sustainable value chains, and efficient dissemination through scientific conferences, hybrid events, and online dissemination through social networks and project websites.
- **Research advancements and innovative tools and practices:** Innovative agricultural models and technologies were developed to meet local needs and market demands (Fig. 5). AI and remote sensing technologies for real-time agricultural monitoring and decision support were successfully introduced together with climate-smart agricultural practices and resource management techniques enhanced productivity and resilience.

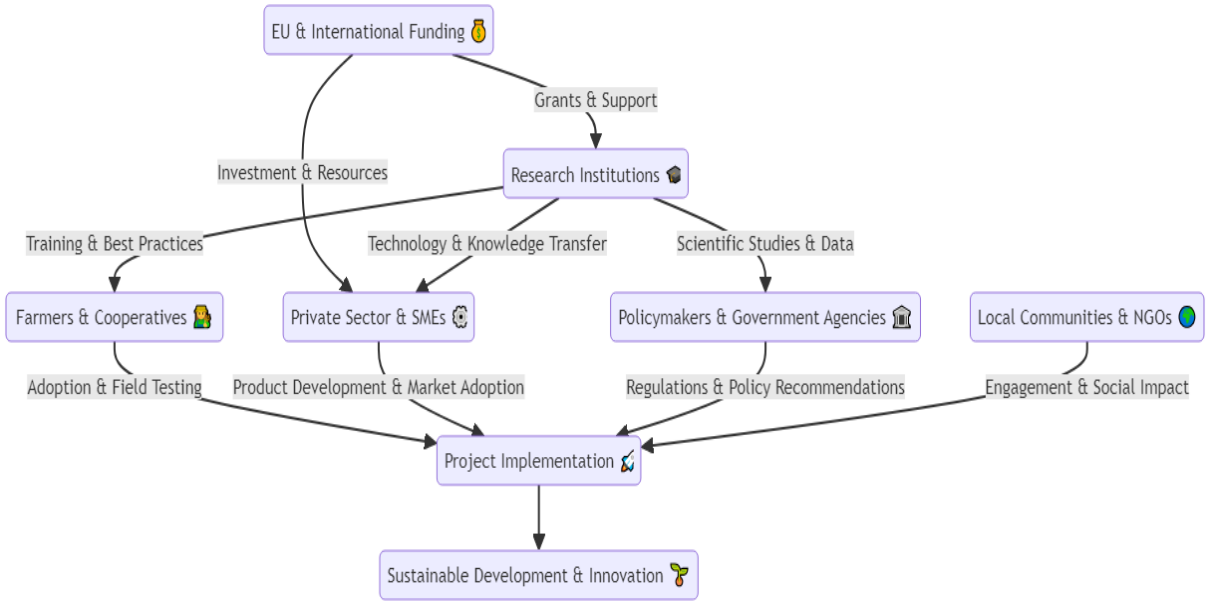

Figure 4: Flowchart illustrating stakeholder interactions in the selected projects

Innovative tools like AI-based monitoring systems and digital platforms provided valuable data for informed decision-making. Geospatial analysis tools for tracking the impact of agricultural innovations were tested. Improved cereal-legume cropping systems enhancing soil health and productivity was validated.

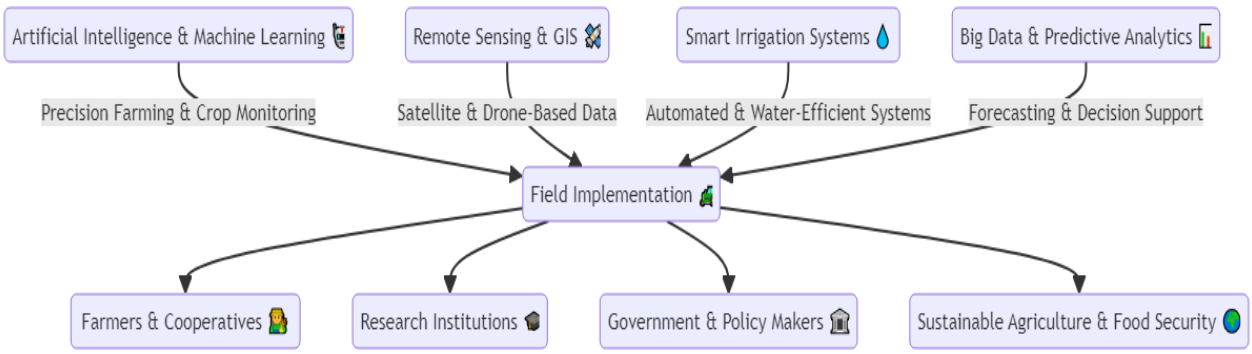

Figure 5: Flowchart illustrating technology innovations in agriculture achieved by the selected projects

- **Technological improvements and innovations:** The projects generated practical solutions with long-term sustainability, such as:
  - Small-scale water harvesting and irrigation systems improving water efficiency.
  - Agroforestry models promoting biodiversity and soil conservation.
  - Strengthened local entrepreneurship and innovation through market integration and capacity development.

Some examples of successful achievements include:

- ✓ **Ento-Economy Project:** Developed sustainable insect-based value chains for improved food and nutrition security in Kenya and Uganda.
- ✓ **AGRO-INNOVA:** Implemented 23 agroforestry models in the Central American Dry Corridor to address climate change adaptation.
- ✓ **Africa-Milk:** Scaled up dairy processing units and inclusive milkshed models for local milk sourcing.

Economic and environmental benefits

The projects strengthened agricultural value chains, improving market access and incomes for smallholder farmers. Ecological intensification practices reduced environmental degradation and increased ecosystem resilience, contributing to long-term sustainability.

Policy advocacy and knowledge systems

The projects fostered interdisciplinary collaboration between research institutions, policymakers, and local stakeholders. Knowledge-sharing mechanisms, such as Innovation Hubs and community action research platforms, created strong networks for continuous learning and improvement.

The projects have made significant achievements in advancing sustainable agricultural practices, enhancing food security, and promoting knowledge systems. However, **gaps remain in digitalisation, regulatory standardisation, and infrastructure investment.** Moving forward, greater emphasis on technology integration, policy alignment, and long-term stakeholder engagement, will be crucial for maximising impact and ensuring sustainability.

4.3 Projects' gaps, overlaps, needs and trends beyond the state of the art

4.3.1 Summary of results

This section of the report summarises the research and innovation gaps, needs, barriers and recommendations identified based on the projects' results. The information is gathered from project information according to the following questions:

5. *What were the R&I gaps and needs identified during and at the end of the project execution?*
6. *Do the established R&I partnerships (e.g. between EU and AU research institutions and between institutes in a larger nexus of research-business-education-policy-society) continue to work in a sustainable way?*

7. What are the conclusions for the next round of financing of partnerships of global scope?

I. Cluster 1 - Sustainable intensification of agricultural/food systems

The R&I gaps and needs

- ✓ **Changes in science management** - similar to Uganda (UnicARSSA), there were structural challenges in governmental bodies dealing with science management, which affected the access to resources and overall guidance.
- ✓ **Innovative technologies** – in many countries (e.g. Ento-economy project in Africa), edible insect value chains remain under-developed, therefore limiting their contribution to food and income security in the region.
- ✓ **Scientific outputs** - many projects did not produce the estimated number of publications (non-refereed and peer-reviewed) foreseen within the project proposals. The main reasons for this can be attributed to delays in the release of funds by funding agencies and due to COVID-19 restrictions and lockdowns.
- ✓ A gap in terms of the **nutrition awareness and production of nutritious products** from the tested staple crops has been identified within the communities. In consultation with the community, training modules in this area have been developed and training has been carried out to strengthen local nutrition-sensitive value chains through research and capacity building of rural entrepreneurs (individuals and SMEs).

Continuing work between established R&I partnerships in a sustainable way

The projects addressed issues of critical socio-political significance, such as ensuring food and nutrition security through the improvement of resilience and productivity of agricultural systems in the face of soil degradation and climate change, developing nutritious foods at the community level and supporting the agro-processing of these nutritious foods. However, the system of monitoring post-project sustainability is less efficient to conclude on how policy makers are taking up the project outputs.

Given the multidisciplinary and multi-stakeholder approach to project implementation, it remains unclear how lessons learned by the collaborating institution have been reflected in the design of subsequent joint projects.

Conclusions for the next round of financing

Established collaborations with the EU and consortiums (e.g. the **LEAP-Agri)** encourage African countries to allocate money for research work to solve problems that are contextual. This presents a unique opportunity for these countries to address agri-food problems, which is often

difficult due to the many pressing needs of their governments. These collaborations also encourage research by African institutions, increasing their visibility in the global academic arena and attracting resources to strengthen institutional capacity. For the European institutions, the LEAP-Agri consortium collaboration fosters broader networks for their institutions as well promoting co-supervision of students, enhancing academic collaboration

The research results are relevant at both regional and international levels. The outputs developed have potential application for national and international trade policymakers and for further strengthening of SME's .

The lessons learned from knowledge co-creation approaches to project implementation, i.e. the type of training that involves interactions with the various stakeholder through the CARPS model, would also benefit policy makers in academia and industry (private sector).

Awareness raising on nutrition, capacity building and community engagement. One of the major components with a strong impact is the capacity building activities. The future projects must continue to raise farmers and value chain actors' capacity with a strong accent on women and youth (as the leading contingency in rural areas). Projects should definitively address increasing inclusion of gender engagement.

Farmers should be trained on topics that are identified during a gap analysis of training needs at the beginning of each project. This must include, among others: (1) sustainable soil management including soil testing and fertiliser use, (2) climate-smart agronomic practices for sorghum, millet, soybeans and groundnuts, (3) group dynamics, (4) post-harvest handling management and waste reduction, (5) value addition and product innovation, (6) agribusiness, marketing and entrepreneurship, (7) financial literacy and (8) digital literacy skills. Further, farmer-managed demonstration plots should be the major instrument for peer-to-peer learning, providing platforms for training on good agronomic practices, processing, consumption and nutrition, and circularity of resources.

II. Cluster 2 - Agri-food systems for nutrition

The R&I gaps and needs

- ✓ **The projects grouped in this cluster had to adapt their schedules due to the COVID-19 pandemic**. For some of the projects, activities scheduled during 2020-2021 and part of 2022, especially monitoring and support missions on the field, joint meetings and events with stakeholders, had to be postponed. The Gantt charts were rescheduled according to the new situation.
- ✓ There is a **lack of quality and safety standards for locally and regionally traded food** and there is an **inadequate post-harvest sector**. **Poor data recording** in African food Systems is also evident.
- ✓ There is **limited understanding of processors' and traders' strategies for enhancing food quality along the value chain.** More research on improvements in the value chains is needed using a participatory approach; acknowledgement of the different stakeholders

in the value chain is needed. Need for training, investments and improved infrastructure will enable processors and traders to supply higher-quality products. Financial net-benefits of processing improvements need to reach processors.

- ✓ It is also **necessary to implement technologies (sensors, software, big data) for the continuous collection of information to** assess the health of fields, cultivars, animals and monitor their health and well-being. These technologies also allow to check the efficiency of the production system and profitability of the economic situation of agriculture, livestock, aquaculture companies and fisheries.
- ✓ **More representative data on nutritional value and safety** including seasonality and different processing and storage technologies are needed. The critical steps for nutritional value and safety along the value chains should be addressed. And the effect of different processing on nutritional value and safety and the behaviour of consumers in the kitchen are issues to be included as well.
- ✓ Finally, the **access to credit for equipment and inputs is essential** to reach innovation up-takers.

Continuing work between established R&I partnerships in a sustainable way

The project InnoFoodAfrica developed the African innovation platform to promote innovative solutions in Africa beyond a single country and a single value chain. The platform provides peer support for small farmers and SMEs, to enable compliance markets and supply chain demands and maintenance of quality control parameters. A networking map with information on potential stakeholders is available to facilitate future collaborations. Viable solutions for the long-term operation of the innovation platform will help ensure the developed technologies and products reach markets in both Africa and Europe.

The projects clearly demonstrated uptake of their aims and activities by major international organisations, such as FAO, WorldFish, IFAD, and international NGOs, which have made contact and utilised their results and experiences. International organisations such as FAO, have invited the projects to contribute to their reports to spread the impact. The Commission will carry out the implementation of accompanying measures such as training/awareness-raising for beneficiaries.

Conclusions for the next round of financing

One of the key remarks from the projects of this cluster is that the necessary major logistic and land financial resources for the support of participants, trainers and demonstration products must be secured. Next funding activities should target beneficiaries and field implementations according to agroecological zones. Specifically, a greater training of farmers and feed producers on fodder production and conservation techniques is needed for animal farming. Additionally, training of beneficiary promoters on financial management and accounting techniques should be included.

The recordings of fish catch, animal farms and crop fields in Africa have deteriorated over the past decade, and much needs to be addressed in this aspect. This task is far beyond the capacity of the funded projects and should be included in the next round of funding.

Future funding should adopt a major involvement of local authorities. It should try to create conditions for better trust between private bodies such as veterinarians and the technical services of the State.

The interaction with big international organisations, such as FAO, and international NGOs is largely advised to increase the impact of the projects.

III. Cluster 3 – Multisectoral (e.g. food security & nutrition, social, knowledge, cities, water management), including expansion and improvement of agri-markets and trade

The R&I gaps and needs

- ✓ Current implementation and commercialisation of results have led to the establishment of supply chains and the development of consumer products. Aspects that proved to be important in the co-construction of sustainable intensification options include **a clear understanding of the current conditions and stakeholders needs. A gender-inclusive approach has also** proven essential in addressing gender roles and the needs of women.
- ✓ Further **development and validation of tools to improve water resource management and support monitoring of water resources** at different scales must be considered. It is necessary to evaluate the opportunities and risks with "solar irrigation", develop new models of smallholder water user associations, and promote **management practices that enhance soil health and ecosystem services and crop diversification** and value chain opportunities brought in with irrigation and enhanced lowland systems.
- ✓ **Research and innovation processes need to ensure timely access to funding** in order to efficiently translate the R&I results into co-creation and implementation practices. Access to funding, including national funding, must be available in a timely way to avoid delayed research progress and address commitment to timelines.
- ✓ Finally, **the projects were affected by the COVID-19 global crisis** in many aspects that influenced the R&I progress. All countries in which partners are based had some level of confinement (compulsory or recommended). Most members could work from home but several researchers, as well as the students involved in the projects, had weaker internet connections than in their offices and the access was limited. Thus, large virtual meetings proved to be practically impossible or difficult to organise. Field work, including meetings with local stakeholders, had to be rescheduled and postponed, affecting negatively the co-innovation phases, as well as the interaction with Stakeholders and Associate Partners. International travel was also restricted and planned interactions between African and

European partners were postponed. There is a need for efficient strategies and plans in cases of *force majeure* events and crises to ease the project development.

Continuing work between established R&I partnerships in a sustainable way

Some of the projects have explored possible links and synergies with other LEAP-AGRI projects. NUTRIFOODS project identified NOURICITY as the best opportunity to obtain synergy and joint work to get innovation and commercialisation. EdiCitNet as a network, invites any cities, initiatives or individuals interested in the field of sustainable food systems – both those already working in it and those who are just starting or want to learn more – to work with them.

Conclusions for the next round of financing

Funding during the co-innovation process at different scales, together with training and reviewing policy recommendations will provide sustainable protocols and innovations. It is necessary to invest in climate-resilient crop-specific agriculture to improve yields and productivity and make it more attractive for farmers to produce these crops and thereby increase their availability. The investment in processing technologies for better technical functionality and fortification potentials of climate-resilient crops will allow the commercialisation of a variety of healthy and attractive foods.

Consumer-centric development of climate-resilient crop enriched attractive and convenient food products must be included within the context of urbanisation. It is important to raise consumer awareness and understanding of the positive attributes of climate-resilient food crops, including the importance of preserving indigenous knowledge and culture.

Success of the selected innovations and tools is conditional on the process being participatory (co-learning). This also required time and resources to re-design the process, validate results and properly disseminate them. A large programme for training on water-pump maintenance and organisation of irrigation at community level is also needed.

Joint actions with policymakers are needed, including the development of irrigation advisory services. The emphasis should be on targeted crops and a lowland development public programme that follows a participative approach for scheme rehabilitation, mobilises local labour and promotes self-organisation.

Better trade conditions should be promoted, in particular for agricultural products, which constitute a key component for a viable food security strategy in Africa.

Identification of policy and investment priorities is a dynamic and important process, which therefore should be structured and regularly monitored and updated in order to make agricultural trade work for improved food security.

It will be crucial to maintain regular interaction with stakeholders -including policymakers from the public and private sectors, NGOs, civil society and researchers -through EU-Africa conferences, seminars, and local or regional policy events.

IV. Cluster 4 - Knowledge system, policy and decision-making

- **The R&I gaps and needs**

Weak institutional capacity in some regions restricted the ability to adopt and scale innovative agricultural practices. Therefore, training, technical assistance, and financial support to strengthen local research institutions and extension services should be provided.

A lack of formalised knowledge-sharing platforms limited cross-regional learning and best practice dissemination. Therefore, it is necessary to develop regional knowledge platforms to facilitate data sharing, peer learning, and collaborative research across countries.

- **Continuing work between established R&I partnerships in a sustainable way**

Despite generating valuable research, many projects struggled to translate their findings into actionable policy recommendations. It is worth establishing policy liaison teams within R&I projects to ensure that research aligns with national and regional development goals.

- **Conclusions for the next round of financing**

The study revealed the following observations and suggestions for further actions:

- ✓ At regional and sub-regional level, rapid appraisals and the identification of entry points for regional agricultural research and extension organisations provide a basis for a joint agenda for action.
- ✓ Awareness, knowledge exchange and communication activities must be implemented to reach out to more partners and stakeholders.
- ✓ Project outputs - such as platforms, frameworks and tools - should be regularly monitored, revised and updated at global, regional and national levels, and linkages with other complementary projects and programmes should be strengthened.

4.3.2 Conclusions on projects' gaps, overlaps, needs, trends beyond the state of the art

The analysis of projects' gaps, overlaps, needs, trends in the state-of-the-art for knowledge and innovation, and their potential impact on policy reveals several cross-cutting messages.

Considering the multi-actor approach, the following issues emerge as key insights crucial for shaping future EU-funded research and innovation (R&I) initiatives:

- **Identified gaps, challenges and recommendations to address them:**

Cross-cutting gaps, challenges and needs are summarised in Figure 6.

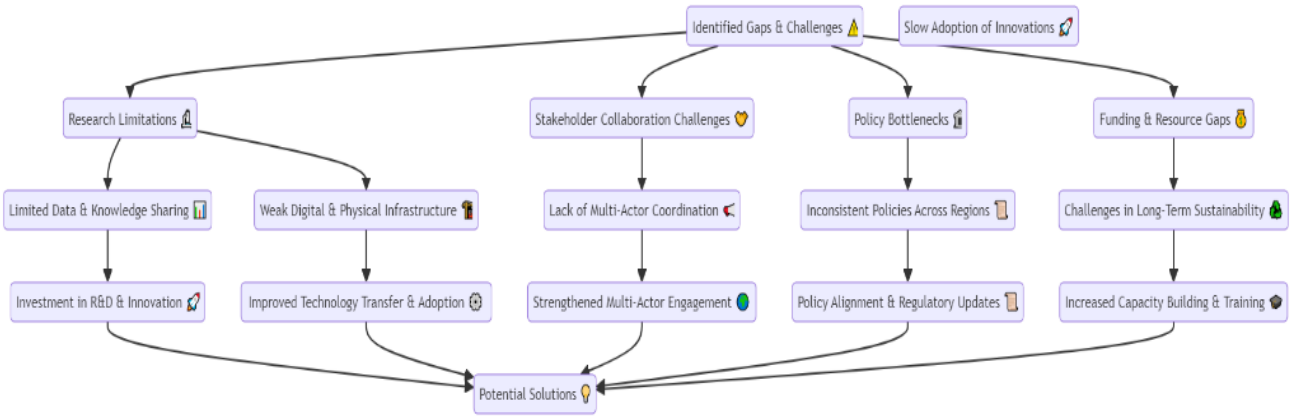

Figure 6: Flowchart illustrating gaps and challenges, overlaps and solutions in research and innovation of the selected projects

Identified cross-cutting gaps:

- Infrastructure deficiencies: Limited investment in infrastructure, particularly for post-harvest handling, storage, and market access, weakens the sustainability of agricultural advancements. This was evident in the AFRICA-MILK project, where lack of cold storage and processing facilities led to significant post-harvest losses.
- Inconsistent stakeholder engagement: Many projects struggled with maintaining partnerships and local community involvement after project completion, leading to short-lived impacts.
- The difficulties for all partners to access funding: Changes in science management, which affected the access to resources and overall guidance.
- Scientific outputs: Many projects did not provide an estimated number of publications and scientific results.
- Poor data recording in African Food Systems.
- Innovative technologies in many countries remained underdeveloped.
- An inadequate post-harvest sector and limited understanding of processors' and traders' strategies for enhancing food quality along the value chain.
- A lack of quality and safety standards for locally and regionally traded food.
- A gap in terms of the nutrition awareness and production of nutritious products.
- Extreme events and *force majeure* such as the COVID-19 pandemic and other global crisis exacerbated most of the mentioned gaps by disrupting fieldwork and stakeholder interaction.

Cross-cutting needs, challenges and recommendations:

- **Scientific approaches and important themes**: The climate-relevant approach is explicit in most projects. Here, the promotion of agroecological innovations considering

ecosystem services, and commitment of the project partners to implement agroecological concepts and principles, should be evaluated during the project preparatory phase and later during the inception phase. Projects which underpin agroecological aspects of Sustainable Food Systems (SFS) should be encouraged. These aspects should cover the SFS at systemic level, e.g. primary biomass production, food processing, recycling, ecosystem services and environmental protection, social justice, etc. The consortiums must employ multi-actor approaches to co-create and co-develop comprehensive agroecology strategies for changes at system level.

- **Post-harvest losses:** Inadequate infrastructure for food processing and preservation led to significant post-harvest losses, reducing marketable output and economic gains. The projects should enhance post-harvest infrastructure and increase funding for processing, packaging, and cold storage facilities to minimise post-harvest losses and improve food safety.
- **Market access barriers:** Small producers faced difficulties accessing regional and international markets due to quality standards, lack of logistics, and limited market knowledge. Additionally, non-tariff measures like sanitary standards, technical barriers, and customs inefficiencies created obstacles for African agricultural exports. Future projects should make efforts to support market integration by providing training and resources for small producers to meet export standards, strengthen local market linkages, and develop value-added products. Harmonised trade policies should be put in place to align national policies with regional and international trade agreements.
- **Water management deficiencies:** Projects like MADFORWATER highlighted the urgent need for efficient irrigation and wastewater management systems, especially in arid regions. Therefore, future programmes should develop water efficiency solutions by e.g. scaling up investment in irrigation infrastructure, rainwater harvesting, and wastewater reuse systems tailored to local contexts.
- **Limited climate resilience:** Some projects identified the need for more climate-smart agricultural practices to combat the effects of droughts and floods. Therefore, it is worth supporting research on agroecological approaches, drought-resistant crops, and soil conservation techniques.

- **Understanding the current state of the African agri-food sector**: There is a clear need to understand the current state of the African agri-food sector and the needs, priorities, and challenges of its diverse stakeholders. The development of Business Models throughout the agri-food sector is a key component of the food transformation. This involves small producer groups, SMEs, traders, and medium and large businesses. One important goal should be to increase business transactions between small actors and buyers at both domestic and regional levels.

- **Structural issues in science management:** Some countries (like Uganda, in the UnicARSSA project) faced challenges due to weak government support and limited resources for science and technology management. This created delays and inefficiencies in research execution and funding access. The institutional support must be strengthened

by e.g. advocating for stronger policy backing and increased funding for science management bodies to create enabling environments for R&I projects.

- **Limited adoption of innovative technologies:** For instance, the Ento-Economy project showed that despite the potential of insect-based food value chains, the technology and infrastructure for mass production and market integration were underdeveloped. Weak institutional capacity in some regions restricted the ability to adopt and scale innovative agricultural practices. Training, technical assistance, and financial support to strengthen local research institutions and extension services should be provided. The future projects should promote scalable technologies and investments in infrastructure to support the adoption of innovative, climate-resilient agricultural technologies at scale. Many projects introduced and tested new and/or adjusted known technologies, practices, systems or services in new contexts, with participatory approaches, and adaption of developed innovations to local contexts. A lack of post-project monitoring limited the long-term impact and sustainability of research outcomes. Therefore, it is highly beneficial to develop sustainability plans and post-project impact assessments to track long-term outcomes, using a common monitoring framework with unified indicators and parameters for measuring project impacts.
- **Fragmented knowledge dissemination:** Some projects lacked sufficient publications and outreach materials, limiting the spread of innovative practices and scientific findings. This could be addressed by e.g. enhancing knowledge sharing and developing comprehensive knowledge dissemination strategies, including more publications, policy briefs, and community outreach programmes. It could be beneficial to develop regional knowledge platforms to facilitate data sharing, peer learning, and collaborative research across countries. Scientific and technical publications and their presentation at technical (and/or political) events in the targeted countries has proven to be an effective instrument for project dissemination.
- **Nutritional awareness and uptake:** A gap was identified in promoting the nutritional benefits of crops and foods developed through these projects. Local communities were often unaware of the potential health benefits of new agricultural practices and products. This could be tackled by integrating nutrition education by including training modules on the nutritional value of crops and sustainable agricultural practices as part of project activities.
- **Crisis disruptions:** Fieldwork, monitoring activities, and stakeholder engagement were severely delayed or postponed as a result of certain unexpected events such as the COVID-19 pandemic, which disrupted field activities and data collection. The constraints on travel and movements have also prompted the usefulness of alternate measures such as online meetings. Future projects should build resilient and flexible project timelines and develop contingency plans to mitigate the impact of external disruptions like pandemics or political instability.
- **Lack of data infrastructure:** Poor data recording and monitoring systems limited the ability to track the nutritional value, safety, and production efficiency of local food systems.

The future programmes should invest in digital monitoring tools, implement digital platforms and big data solutions to track production efficiency, market trends, and nutritional outcomes.

- **Innovation for digitalisation**: Digitalisation of the agri-food systems should be encouraged in the next round of funding. Digital tools for farming and agriculture, aimed to improved productivity and welfare are needed. Digitalisation of the whole food chain and local markets, involving activities relating to market linkages and other digital services should get funding. Strong efforts should be made to promote the integration and delivery of digitalisation within the food system, alongside the implementation of smart and digital services that support rural transformation, and drive benefits in health, education, jobs, welfare.
- **Regulations**: There is a clear need to establish regulatory validations that support policy by providing evidence that developed processes and new products meet national and international regulatory requirements. The approach should be holistic and based on integrated policy efforts, involving collaboration among researchers, commercial entities, markets and policymakers. The continuing involvement of local authorities is necessary to increase trust between farmers, private bodies - such as veterinarians in the case of animal food production – on the one hand, and government bodies on the other.. Research and results should be effectively communicated to policymakers in order to address funding measurements for the implementation of technologies for increased productivity, resilience and affordability of the food systems. The engagement of international organisations such as FAO and international NGOs is key to ensuring widespread and successful involvement of governments.
- **Capacity building:** Expanding training programmes for farmers, SMEs, and local institutions is essential for sustaining knowledge transfer and innovation. UnicARSSA's participatory research platforms successfully connected smallholder farmers with academic institutions for knowledge exchange.
- **Multi-actor coordination:** The involvement of diverse stakeholders often led to slow decision-making and conflicting priorities, delaying project execution. Therefore, the projects should foster collaborative governance by establishing clear roles, responsibilities, and decision-making frameworks to streamline multi-actor collaborations.
- **Investment in market development:** Strengthening local value chains and market infrastructure is crucial for scaling agricultural innovations and ensuring economic sustainability. The ATMA4FS project highlighted trade barriers and policy misalignment as major challenges for market access.
- **Duration of projects:** On several occasions, the project required an extension in order to engage stakeholders more efficiently and to better integrate them into the project for improved project outcomes.

- **Policy misalignment:** A lack of coordination between national agricultural policies and international trade agreements limited the effectiveness of market access initiatives. It is recommended to strengthen institutional coordination and foster better collaboration between trade ministries, agricultural departments, and research institutions to address policy gaps.
- **Limited private sector involvement:** Insufficient engagement with private sector actors weakened value chain development and market-driven innovation. It should be addressed by involving agribusinesses and financial institutions in project planning and implementation to drive market-oriented solutions.
- **Funding delays:** Late disbursement of funds caused project start-up delays and disrupted research activities. Streamlined administrative processes to facilitate faster fund disbursement and project initiation are needed.
- **Limited gender and youth inclusion:** Many projects failed to fully integrate women and young people into research and implementation activities. Therefore, gender and youth engagement must become a core requirement for project funding and implementation strategies.

The **projects' gaps and needs** analysis reveals clear opportunities to strengthen the design, implementation, and impact of future EU-funded R&I initiatives. By addressing structural weaknesses, enhancing technological adoption, fostering policy integration, and promoting inclusive approaches, these projects can drive transformative change in global agri-food systems.

Cross-cutting overlaps and opportunities:

- **Shared objectives:** Many projects focus on common themes like food security, capacity building, and sustainable practices. This overlap suggests potential for enhanced collaboration and knowledge-sharing. Projects like NUTRIFOODS and EdiCitNet worked on sustainable food systems and urban agriculture, offering opportunities for cross-learning.
- **Cross-project synergies:** Research on climate-smart agriculture and value chain development offers an opportunity to integrate findings and scale up successful interventions. For example, AGRO-INNOVA's agroforestry models could complement Ento-Economy's value chain approach, enhancing environmental sustainability and food security.

Emerging cross-cutting trends:

1. **Interdisciplinary and multi-actor collaboration:** Successful projects often blend technological, social, and environmental expertise while engaging diverse stakeholders. Projects like TAP-AIS supported innovation systems through policy formulation and investment scaling.
2. **Innovation for sustainability:** There is an increased focus on climate-smart agricultural practices and ecosystem preservation. Projects like MADFORWATER

developed integrated wastewater treatment solutions for arid regions, addressing water management challenges.

3. **Policy impact:** Projects increasingly prioritise shaping policy through evidence-based research, but structured mechanisms for influencing decisions remain underdeveloped. Efforts to align research findings with national policies and international agreements need strengthening.

Addressing these gaps and leveraging identified synergies will require strategic investment in digital technologies, infrastructure, and capacity-building initiatives. Aligning project goals with national policies and fostering long-term stakeholder engagement will enhance the systemic transformation of agri-food systems. Future EU-funded R&I programmes should prioritise these areas to maximise impact and sustainability.

5. Conclusions and Recommendations

5.1 Key Achievements

The below conclusions are summarising the major outcomes, research advancements, and impacts from the detailed analysis of the four thematic clusters of projects:

1. **Cluster 1 – Sustainable intensification of agricultural/food systems**
   Projects: Ento-Economy, UnicARSSA, ABEE, AGRO-INNOVA

Increased agricultural productivity: The projects successfully implemented techniques to improve agricultural output while maintaining environmental sustainability. For example, Ento-Economy introduced insect-based value chains, enhancing local food security and reducing reliance on traditional protein sources. AGRO-INNOVA developed agroforestry models adapted to climate change, promoting soil conservation and crop diversification.

Capacity building and community engagement: Strong emphasis was placed on training farmers and local stakeholders. For instance, the UnicARSSA created participatory action research platforms, connecting smallholder farmers directly with universities to exchange knowledge and adapt technology to local conditions.

Technological innovations: Innovations included AI-based tools for pest control, remote sensing for agriculture monitoring, and advanced crop breeding programmes focused on resilience and nutrition. These advancements addressed both productivity and climate resilience.

Impact on livelihoods: Farmers adopting these new practices reported improved yields, higher incomes, and better resilience against climate shocks like drought and floods. Communities benefited from enhanced nutritional security and sustainable farming practices.

2. **Cluster 2 – Agri-food systems for nutrition**
   Projects: InnoFoodAfrica, AFRICA-MILK, SmallFishFood

Nutritional product development: The projects developed affordable, nutrient-dense food products aimed at combating malnutrition. InnoFoodAfrica focused on climate-resilient crops like sorghum and cowpeas, while AFRICA-MILK worked on scaling up inclusive milk value chains. SmallFishFood addressed fish-based food security by enhancing fish preservation techniques and supply chains.

Holistic approach to food systems: By integrating social, economic, and technical innovations, the projects created value chains with long-term sustainability. They improved seed varieties, enhanced dairy processing units, and extended the shelf-life of fish products through better post-harvest techniques.

Market impact and value chain strengthening: These initiatives connected small producers with larger markets, creating stable demand and reliable supply chains. The development of functional multiservice collection centres in AFRICA-MILK provided a model for scaling local dairy production.

Health and social benefits: By addressing the triple burden of hunger, micronutrient deficiencies, and non-communicable diseases, these projects improved public health outcomes. They especially focused on vulnerable groups, like children and women of reproductive age.

3. **Cluster 3 – Multisectoral approaches (food security, social aspects, water management), including expansion & improvement of agri-markets and trade**
   Projects: NUTRIFOODS, EdiCitNet, MADFORWATER, WAGRINNOVA, ATMA4FS

Innovative water management solutions: MADFORWATER developed integrated wastewater treatment and reuse systems tailored to semi-arid regions, enhancing agricultural efficiency and resilience against water scarcity.

Urban agriculture and edible cities: EdiCitNet promoted the concept of urban food production through green infrastructure, creating sustainable and socially inclusive food systems in cities.

Climate-resilient crop promotion: NUTRIFOODS championed local climate-resilient crops, increasing their availability and market potential. They developed scalable models for food production and consumption in urban settings.

Cross-sector collaboration: These projects engaged stakeholders from academia, industry, and local governments, fostering multi-actor innovation hubs and strengthening policy dialogues.

Trade and market access: ATMA4FS provided policy-driven insights into agricultural trade dynamics between African regions and EU markets. It identified key barriers like non-tariff measures, logistical issues, and trade standards.

Policy formulation support: The ATMA4FS project's research provided evidence for crafting policies that improve market access and stabilise food prices, ensuring fair trading practices, and minimising market disruptions.

Capacity building for market participants: Workshops and stakeholder engagement events equipped traders, policymakers, and producers with knowledge on value chain efficiency and market compliance requirements.

4. **Cluster 4 – Knowledge systems, policy, and decision-making**
   Projects: TAP-AIS, VALUMICS, CDAIS

Capacity development for innovation systems: TAP-AIS established a global platform to enhance national agricultural innovation systems, supporting policy formulation and investment scaling.

Food value chain analysis: VALUMICS created tools to evaluate the resilience and sustainability of food value chains, enabling evidence-based policy decisions for agricultural development.

Policy recommendations: CDAIS worked on creating roadmaps for capacity development and innovation support, promoting sustainable agricultural practices and stakeholder collaboration.

Cross-cutting achievements:

- **International collaboration:** Strong partnerships between EU and African/Latin American/Asian institutions ensured diverse perspectives and inclusive innovation.
- **Digital tools and innovation:** Remote sensing, AI-based pest control, and digital literacy training for farmers played a key role in modernising agri-food systems.
- **Gender and youth inclusion:** Several projects focused on empowering women and youth, ensuring their active participation in agricultural value chains.

5.2 Policy Implications & Future Recommendations – key take-aways for future R&I projects

The major takeaways and their meaning for shaping future R&I projects in the EU and beyond are summarised below.

Strengthening international collaboration and partnerships

The EU's agri-food R&I funding must continue prioritising international collaboration, especially in low- and middle-income countries. Strategic partnerships with Africa, Latin America, and Asia are vital for global agricultural sustainability. Projects like TAP-AIS and UnicARSSA showed the importance of knowledge exchange between EU and non-EU countries. Future initiatives should establish more formalised learning platforms to share best practices, data, and innovations. Projects should aim at developing long-term collaboration frameworks between EU and global research institutions to ensure knowledge transfer and mutual capacity building.

Supporting digitalisation and innovation in agri-food systems

Tools such as an AI-based pest control and remote sensing (e.g., developed in AGRO-INNOVA and Ento-Economy) demonstrated the transformative potential of digital technologies. Future funding should emphasise tech-based innovation for productivity and sustainability. In many regions, limited access to digital tools and reliable internet hinders adoption. Projects should include capacity-building around digital literacy and invest in physical infrastructure. Projects should aim to broaden the implementation of digital innovations by funding projects that develop and deploy smart agricultural solutions and digital marketplaces for farmers

Promoting inclusive and multi-actor approaches

Projects like EdiCitNet and SmallFishFood highlighted the importance of involving local communities in the co-creation of solutions. Participatory research ensures local knowledge and needs shape project design and implementation. Future R&I projects should prioritise the

inclusion of women and young people, not only as beneficiaries but also as active participants and leaders. Programmes like "Women Empowering Women" are great examples of this approach. The multi-actor and transdisciplinary approaches should become a requirement of funding eligibility, ensuring projects prioritise stakeholder engagement and capacity-building.

Strengthening monitoring and sustainability mechanisms

A key gap identified was the lack of mechanisms to monitor the long-term impact and sustainability of project outcomes. Strengthening exit strategies, follow-up activities, and sustainability plans is crucial. Projects should adopt unified indicators to track innovation uptake, community impact, and policy influence over time. Projects should aim at establishing a standardised framework for long-term impact assessment in R&I projects, ensuring continuous feedback and learning.

Addressing funding gaps and financial sustainability

Short-term project cycles often limit the depth and sustainability of research outcomes. Longer funding horizons allow for deeper capacity-building and more robust impact measurement. The projects should aim at encouraging partnerships with national governments, international organisations (like FAO and IFAD), and private sector actors to pool resources and scale up successful initiatives. There is a need to develop funding mechanisms that support multi-phase projects, moving from research and innovation to large-scale implementation and policy adoption.

Prioritising climate-resilient and sustainable food systems

Future R&I projects should emphasise sustainability by promoting climate-smart agricultural practices, ecosystem services, and biodiversity conservation. Projects like NUTRIFOODS demonstrated the value of promoting indigenous crops and local value chains to enhance food security and economic resilience. There is a need to align future R&I funding calls with global climate and sustainability goals, like the EU Green Deal and UN SDGs.

Strengthening capacity-building and education

Training on topics like digital literacy, climate-smart practices, and value chain management should be central to R&I projects. The projects should aim at strengthening the capacity of local research institutions, extension services, and innovation hubs to support long-term agricultural transformation. The projects should aim at increasing funding for educational components within R&I projects, ensuring knowledge dissemination and skill-building are core deliverables.

Fostering market access and value chain development

Projects like ATMA4FS highlighted barriers to agricultural trade in Africa, including non-tariff measures and logistical challenges. Future projects should prioritise market access and value chain efficiency. SMEs play a crucial role in agricultural development. Supporting their growth through innovation and market linkages is essential. The projects should aim at promoting value-

chain development by funding projects focused on market-driven agricultural innovation and trade facilitation.

Enhancing policy-coherent innovation and integration, alignment and uptake of research outputs

Research projects should be designed to address specific policy gaps and support evidence-based decision-making. Projects should aim to strengthen advocacy efforts to ensure that R&I outcomes inform national and international agricultural policies. Establishing dedicated policy liaison teams within R&I projects is essential to translate research findings into actionable policy recommendations and to align research with national and regional development goals. Strengthening outputs such as policy briefs, white papers, and tailored reports for policymakers would further improve the uptake of scientific findings. National and regional governments need to be involved from project inception to ensure alignment with their policy priorities. Early engagement improves the likelihood of research outcomes being implemented. Projects should aim at creating advisory boards within R&I projects composed of policymakers, to ensure research aligns with national development plans and legislative frameworks. Greater coordination between project goals and national development policies will strengthen local ownership and improve agricultural transformation. Projects like VALUMICS have created tools for evaluating food value chains, which can inform evidence-based policy decisions.

The policy implications and future recommendations from the RefreSCAR PA R&I Report highlight significant outcomes, research advancements, and impacts from the investigated portfolio of projects. They also clearly call for a more integrated, collaborative, and long-term approach to agricultural research and innovation in the future to ensure widespread impacts are achieved. By strengthening partnerships, promoting inclusive practices, supporting digitalisation, and aligning research with policy needs, future EU-funded projects can significantly advance global agri-food system transformation.

Annexes

ANNEX 1. ADDITIONAL INFORMATION ON THE PA PROCESS & COORDINATION MEETINGS

Several meetings between the RefreSCAR coordination team, the SWG ARCH team and the PA authors were organised. They were both in an online and face-to-face format and aimed at clarification of the PA tasks, methodology and approach, discussion on the progress, and coordination of the PA activities.

The meetings timeline is presented in Table 4.

Table 4. The timeline and content of the coordination meetings for the PA execution

Timing	Items
19 July 2024	**Preliminary RefreSCAR inception meeting** with selected experts
21 August 2024	**Inception meeting** with the SCAR WG ARCH, RefreSCAR Coordination team and the two appointed experts to discuss and agree on the final ToR, the progress of the scientific work including the selection of the relevant databases and projects in the topic area of the PA request, and to familiarise with the requirements of the SWG ARCH.
13 September 2024	**Discussion meeting** with the SCAR WG ARCH Chairs and the two appointed experts to discuss and agree on the progress of the scientific work executed after the last meeting on August 30th. To provide a preliminary list of the **EU investments in research, innovation and international partnerships** for the transformation of agri-food systems towards greater sustainability beyond the EU to select 30 projects.
22 November 2024	**SCAR SWG ARCH meeting**: Presentation of the approach and preliminary results (by the team conducting the study)
31 January 2024	Delivery of the first Draft PA Report

Herewith, a more detailed information on these meetings is provided:

Inception meeting

Location: Online

Date: 21 August 2024

Time: 10:00 – 11:00 CEST

Participants	
Vladislav Popov	Agricultural University of Plovdiv (Bulgaria)
Isabel Medina	CSIC (Spain)
Emmanuel Albina	CIRAD (France)
Siegfried Harrer	BLE (Germany)
Orlaith Ni Choncubhair	Teagasc (Ireland)
Nikki De Clercq	ILVO (Belgium)

Objective: Organise inception meeting with the SCAR WG, the RefreSCAR Coordination Team and the two appointed experts to discuss and agree on the final ToR, the progress of the scientific work including the selection of the relevant data-bases and projects in the topic area of the PA request, and to familiarise with the requirements of the SWG ARCH.

Discussion meeting 1

Location: Online

Date: 13 September 2024

Time: 15:00 – 15:30 CEST

Participants	
Vladislav Popov	Agricultural University of Plovdiv (Bulgaria)
Isabel Medina	CSIC (Spain)
Emmanuel Albina	CIRAD (France)
Siegfried Harrer	BLE (Germany)

Objective: Organise a follow-up meeting with the SCAR WG Chairs and the two appointed experts to discuss and agree on the progress of the scientific work executed after the last meeting on August 30th. To provide a preliminary list of the **EU investments in research, innovation and international partnerships** for the transformation of agrifood systems towards greater sustainability beyond the EU to select 30 projects.

Discussion meeting 2 – SWG ARCH

Location: Online

Date: 26th November 2024

Time: 15:00 – 16:00 CEST

Objective: The SWG ARCH chair and co-chair together with some ARCH members organised the last meeting for 2024 to discuss several points, including the progress of the PA. The PA authors presented the approach, preliminary PA results from Phase I, including an Excel database with the Phase 1 selected projects, and their approach to commence Phase II of the PA study. A shortlist of 15 key projects was suggested for further in-depth instead of 10 as requested by the PA ToR. Among others, the arguments for this were related to the scope and significance of the project outcomes.

The PA authors took a stepwise approach to the analysis.

The first step was clustering the 15 selected projects in view of their scope and relevance for the agri-food transformation and alignment with the project selection criteria (see Table 5).

Table 5. STEP 1: Clustering of the selected 15 PA projects for Phase II

Clusters	**1.** Sustainable intensification of agricultural/food systems	**2.** Agri-food systems for nutrition	**3.** Multisectoral, including expansion and improvement of agri-markets and trade	**4.** Knowledge system; Policy and decision-making
Criteria for selection	Ento-Economy	InnoFoodAfrica	NUTRIFOODS	TAP-AIS
	UnicARSSA	AFRICA-MILK	EdiCitNet	VALUMICS
	ABEE	SmallFishFood	MADFORWATER	CDAIS
	AGRO-INNOVA		WAGRINNOVA	
			ATMA4FS	
Completed in the last 10 years	X	X	X	X
Related to the continuum "research-innovation-impact-capacity building"	X	X	X	X
Strong scientific and practical outputs	X	X	X	X
Funded by DG-RTD (H2020 then HE), DG-INTPA (e.g. DeSIRA projects) or any other EU funding authority	X	X	X	X
Focus on transformation of agri-food systems (from primary production to diets) for greater sustainability	X	X	X	X
Interdisciplinary, transdisciplinary and multi-actor projects with innovation component	X	X	X	X
International dimensions (e.g. the composition of the	X	X	X	X

consortium, not only from the EU)				
Strategic partnerships of the EU (e.g. Africa, Mediterranean, Latin America) and the low and middle- income countries.	X	X	X	X

In addition to the available public data, the authors decided to perform an interview with the project coordinators (Step 2). The questionnaire (see Table 6) contains questions that are important for identifying the **R&I gaps and needs during and at the end of the project execution.**

Table 6. STEP 2: Questionnaire for selected PA projects

Questions */to coordinators/*	**Level of achievement** */fully, partially, Why?/*	**Short description/ examples**
Has the project achieved its objectives and promised results e.g. technological, social, environmental and economic outputs, outcomes and impacts?		*Please provide examples*
What were the major R&I advancements related to the major research component (from basic to finalised), innovation, capacity building, interdisciplinarity, transdisciplinarity and multi-actor engagement?		*Please provide examples*
What were the major technological, economic, environmental and social benefits delivered to stakeholders, and will they be sustainable upon the project exit?		*Please provided short (successful and unsuccessful) examples/cases*
Has a synergistic effect at international, national and regional level and potential leverage effects been achieved?		*Please provide examples*
What were the R&I gaps and needs identified during and at the end of the project execution?		
Do the established R&I partnerships (e.g. between EU and AU research institutions and between institutes in a larger nexus of research-business-education-policy-society) continue to work in a sustainable way?		*Please provide short (successful and unsuccessful) examples.*
What are the conclusions for the next round of financing of partnerships of global scope?		*Please provided some recommendations in view of financing (total and distribution among the EU and e.g. the AU partners), monitoring the value-*

		for-money impact, capacity building, etc.

ANNEX 2. PROJECT FICHES

This annex is delivered as a separate pdf document. It consists of the key findings for each of the 15 short-listed projects, including a project overview, results summary and an indication of overlaps or gaps of the project content compared to other projects in the portfolio.

ANNEX 2 – PROJECT FICHES

SCAR ARCH Strategic Working Group

RefreSCAR Portfolio Analysis on 'Achievements of EU Research, Innovation and Development projects in the last 10 years to address the global challenge of agriculture transformation' – PROJECT FICHES

January | 2025

Authors:

- Prof. Vladislav Popov, Agricultural University of Plovdiv (AUP), Bulgaria
- Prof. Isabel Medina, Consejo Superior de Investigaciones Científicas (CSIC), Spain

List of 15 in-depth analysed projects

1. Edible Cities Network Integrating Edible City Solutions for social resilient and sustainably productive cities - **EdiCitNet**
2. DevelopMent AnD application of integrated technological and management solutions FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries – **MADFORWATER**
3. Small Fish and Food Security: Towards innovative integration of fish in African food systems to improve nutrition – **SMALLFISHFOOD**
4. Developing capacities in agricultural innovation systems: scaling up the Tropical Agriculture Platform Framework – **TAP-AIS**
5. Understanding food value chains and network dynamics – **VALUMICS**
6. Innovative approaches to value-addition and commercialization of climate-smart crops for enhanced food security and nutrition in Africa and beyond – **NUTRIFOODS**
7. Co-innovations across scales to enhance sustainable intensification, resilience, and food and nutritional security in water-managed agricultural systems in West Africa – **WAGRINNOVA**
8. University-based Community Action Research for increasing viability of cereal-legume value chains towards improved nutrition and livelihoods in sub-Sahara Africa – **UnicARSSA**
9. Capacity Development for Agricultural Innovation Systems – **CDAIS**
10. West African Breeding networks and Extension Empowerment – **ABEE**
11. Promote ecological intensification and inclusive value chains for sustainable African milk sourcing– **AFRICA-MILK**
12. Adapted Agroforestry Systems for the Central American Dry Corridor – **AGRO-INNOVA**
13. Agricultural Trade and Market Access for Food Security: MicroandMacro-level Insights for Africa - **ATMA4FS**
14. Enhancing food and nutrition security through promotion of edible insects value chain in Eastern Africa – **Ento-Economy**
15. Locally-driven co-development of plant-based value chains towards more sustainable African food system with healthier diets and export potential – **InnoFoodAfrica**

1. Edible Cities Network Integrating Edible City Solutions for social resilient and sustainably productive cities - **EdiCitNet**

PROJECT INFORMATION

Source(s)

CORDIS website: https://cordis.europa.eu/project/id/776665
Project website: https://ediblecitiesnetwork.com/

Funding details

Source of funding: EU Horizon 2020 SOCIETAL CHALLENGES - Climate action, Environment, Resource Efficiency and Raw Materials; H2020-SCC-NBS-2stage-2017

Type of project (+ cluster if relevant): IA–Innovation Action

Contract number: Grant Agreement No. 776665

Project total budget (€): € 11 763 163

Start and end date of the project

1 September 2018 – 29 February 2024

Project summary

The systemic use of urban landscapes for food production is a major step towards more sustainable, liveable and healthier cities. A multitude of initiatives around the World, however fragmented, are prospering, forming a global movement of Edible Cities. Their products, activities and services – the Edible City Solutions (ECS) - empower local communities to overcome social problems by their inclusive and participatory dynamics and to create new green businesses and jobs, and thereby generating local economic growth and fostering social cohesion. EdiCitNet will leverage the substantial benefits that ECS effect today at local level and catalyse their replication EU- and world-wide by launching a fully open and participatory network of cities, empowering their inhabitants by a common methodology.

The objectives are to launch and develop a sustainable and constantly growing network of cities, empowering their inhabitants by a common methodology to systematically explore the wealth and diversity of existing Edible City Solutions (ECS) and to build and share a common knowledge base, and to empower city administrations to adapt, plan and implement successfully proven ECS in their specific urban context.

To make this happen, EdiCitNet closes knowledge gaps in the effective implementation of ECS and their transformation into sustainable, innovative business models. This new insight feed into an openly shared and globally accessible knowledge base and methodology to enable sustainable and evidence-based integration of ECS into the long-term urban planning of cities covering a large spectrum of urban, climatic, social, environmental and cultural contexts.

Project results

- ✓ Established network of cities, organisations and individuals connected, communicating, collaborating and sharing expertise – both through in-person events and an online platform.
- ✓ An online platform that acts as a central hub for the topic of edible cities, offering multiple key stakeholders (city administrators, entrepreneurs, organisations + individuals) the chance to discuss, connect, share expertise, assess, compare + design different edible city solutions.
- ✓ Innovative edible city solutions installed, tested and refined in Living Labs in multiple cities, offering multiple benefits to local stakeholders. In the Edible Cities Network project, Living Labs are spaces where people from all sectors of society come together in "City Teams" to develop strategies for more sustainable, resilient and social cities.
- ✓ Edible city masterplans co-created by city administrators and local stakeholders. 5 Front Runner Cities (FRC), supported by a highly interdisciplinary consortium of city authorities, SME, NGOs and academia demonstrate their unique experience with own Living Labs and transfer their knowledge to 7 dedicated Follower Cities (FC), determined to replicate ECS for the benefit of their inhabitants. The carefully selected group of FRC and FC allows to study and monitor implementation in large variety of environments and ensures truly global outreach with city partners based in Central America, Africa and East Asia.
- ✓ A range of guidelines, tools and methodologies for edible city entrepreneurs and initiatives to support the development and growth of their business or organisation.
- ✓ Educational materials for different target groups on edible city theory + practice, including factsheets, materials for children and a MOOC.

Lead partner

HUMBOLDT-UNIVERSITAET ZU BERLIN, Germany

Other partners

The project was developed by 32 partners with representatives from local city administrations, NGOs, businesses and research institutes. Partner details: https://ediblecitiesnetwork.com/consortium

Contacts

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Relevant links

Documents, reports (17)

EdiCitNet online Market Place

This is the pilot version of the market place is a part of the EdiCitNet website which provides ECS initiatives worldwide a platform to get in contact with other ECS and exchange products and services via the platform

International network established

Documented by an online platform going live.

Annual conference report

A short, four-page summary report highlighting key aspects of each annual conference. This report covers the annual conference 2019. Every 12th month a report is going to be delivered after the annual conference. Reports for the following annual meetings will be uploaded in the Zenodo community of EdiCitNet in open access: https://zenodo.org/communities/edicitnet

Adapted TPM Method

The TPM method to develop transition pathways has been successfully adapted for the specific aims of EdiCitNet (creation of masterplans for the integration of ECSs in urban planning) and to the cultural, administrative and language needs of participating FCs and summarized in a report.

Share web space and ICT tools for internal communication and collaboration

Internal communication running

Guideline for participative impact monitoring

D5.2 Guideline for participatory impact monitoring (incl. citizen science)

Aggregated risk management matrix

An overview risk management matrix, collated from the risk management activities conducted in each city and including project-level risks, with indicators for monitoring risks and clearly assigned indicators

Action plan of EdiCitNet Business Consulting Team

Prioritised Indicators and baseline – draft status

Prioritised Indicators and baseline – draft status. Introduction for the choice of the final indicators presented in D5.5.

Refinement of the plan for the exploitation of the project's results

Refinement of the plan for the exploitation of the project's results (link to D7.1)

Refinement of plan for the dissemination, communication and training activities

Refinement and adjustment of plan for the dissemination communication and training activities

D1.1 EdiCitNet governance approach and guidelines Report

Report detailing reviewing of the literature, methodology used and full description of governance model approach, including guidelines and instructions.

Local working groups established, functioning and communicating well in all cities

Documented by signed ToRs and meeting minutes collected from each city and collated into a dossier.

Kick-off meeting

Kick-Off meeting, opening speeches with AB Member and other guests.

Documentation of existing ECSs in FCs

Report with detailed documentation describing the already existing ECSs in the follower cities.

Prioritised Indicators and baseline - Final version

This is an overview of the chosen indicators suitable for the Living Labs in the project The work done in month 9 D51 was an introduction for a choice of the final indicators to be adopted and

their baseline and ensure a solid basis for the monitoring system in the project The D55 is an update of the D51
Stakeholder power/interest maps
Stakeholder power/interest maps to adjust plans for stakeholder and other participants
Websites, patent fillings, videos etc. (2)
Other (4)

Publications

Peer reviewed articles (13)
Monographic books (2)
Other (4)
Book chapters (6)
Thesis and dissertations (1)

Datasets

Datasets via OpenAIRE (4)

Software

Software via OpenAIRE (1)

Other Research Products

Other Research Products via OpenAire (8)

Relation to SCAR ARCH SWG PA scope

Multi-aspect project, addressing Food security and Nutrition: by social, knowledge, cities. Falls under the continuum "research-innovation-impact-capacity building" with an international dimension, food nutrition, food supply, food quality, food security, new green businesses and jobs, empower local communities, Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical areas with a special attention to the EU strategic partnerships.

Research advancements

- ✓ to systematically explore the wealth and diversity of existing ECS,
- ✓ to adapt, plan and implement successfully proven ECS in their specific urban context.

Research component (from basic to finalized)

- ✓ innovation for green, resilient and inclusive cities
- ✓ Edible Cities Network Consulting Guidebook 2024.pdf
- ✓ An introduction to the Edible Cities Network platform and services https://youtu.be/4rcGo-Ytk8Q?si=2w-1LjoJKlhm2g_E

Overlaps and gaps of the project content compared to the other projects in the portfolio

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2. DevelopMent AnD application of integrated technological and management solutions FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries - **MADFORWATER**

PROJECT INFORMATION

Source(s)

CORDIS website: https://cordis.europa.eu/project/id/688320
Project website: https://www.madforwater.eu

Funding details

Source of funding: EU Horizon 2020 funded under SOCIETAL CHALLENGES - Climate action, Environment, Resource Efficiency and Raw Materials; H2020-WATER-2015-two-stage

Type of project (+ cluster if relevant): HORIZON 2020 RIA - Research and Innovation Action

Contract number: Grant Agreement No. 688320

Project total budget (€): € 3 722 168

Start and end date of the project

1 June 2016 – 30 November 2020

Project summary

Climate change and population growth are expected to exacerbate the water crisis of Mediterranean African Countries (MACs), where agriculture accounts for 80-85% of freshwater consumption. The project objectives are as follows:

- Improved analysis of water vulnerabilities in Egypt, Morocco and Tunisia
- Development of technologies for wastewater treatment and agricultural reuse
- Development of integrated water & land management strategies
- Increased capacity building in relation to water management
- Promotion of business opportunities for water & irrigation enterprises.

MADFORWATER develops and adapts to three main hydrological basins in the selected MACs technologies for the production of irrigation-quality water from drainage canals, municipal, agro-industrial and industrial wastewaters, and technologies for water efficiency and reuse in agriculture, initially validated at laboratory scale. Selected technologies are further adapted and validated in four field pilot plants of integrated wastewater

treatment/reuse. Integrated strategies for wastewater treatment and reuse targeted to the selected basins are developed, and guidelines for the development of integrated water management strategies in other basins of the three target MACs are produced, considering climate change, population increase and economic growth scenarios. The social and technical suitability of the developed technologies and non-technological instruments in relation to the local context are evaluated with the participation of MAC stakeholders and partners. Guidelines on economic instruments and policies for the effective implementation of the proposed water management solutions in the target MACs are developed. The project leads to a relevant long-term impact in Egypt, Morocco and Tunisia in terms of increased wastewater treatment, wastewater reuse, food production and income in the agricultural and water treatment sectors, and decreased groundwater exploitation, water pollution and food contamination.

Project results

In MENA, agriculture accounts for more than 80 % of freshwater use. The EU-funded MADFORWATER project has developed integrated technologies and management tools to significantly boost the use of treated wastewater for irrigation and enhance water efficiency in agriculture.

Solutions are adapted to be technically and culturally suitable within the environmental and socioeconomic context of the target MACs. Integration of water demand and water supply tailors wastewater treatment and irrigation to available wastewater types and crops typical of the target countries. Integration is facilitated through tailored technologies, decision support tools, and water and land management strategies.

- The developed and adapted technologies for wastewater treatment and irrigation have being optimised.
- Scale-up and validation of selected technologies are taking place at four pilot plants: one in Egypt, one in Morocco, and two in Tunisia.
- Pilots are processing and utilising municipal wastewater, drainage canal water and textile wastewater.
- For the irrigation pilots, all the technologies tested have proved effective to date.
- MADFORWATER SMEs are developing business plans for implementation in MENA countries as well as guidelines for adaptation in different contexts. Several patent applications are also underway.
- The project demonstrated the ability to boost the reuse of treated wastewater for irrigation in developing countries faced with severe water scarcity. It is made possible by tight integration between technological innovation and sustainable water management tools.

Lead partner

ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA, Italy

Other partners

18 partners, 5 of which from the 3 MACs and 1 from China. Partner details:

https://www.madforwater.eu/partners

Contacts

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Relevant links

Documents, reports (16)
Stakeholder Consultation Workshops
Comprehensive report on the SCWs (T7.3)
Water vulnerability assessment framework
For each selected basin, a report on water management practices and water vulnerabilities, and a water vulnerability assessment framework based on the current situation. The report will include a general description of the water vulnerability assessment tool (T1.4)
First update of the dissemination and communication plan
Intermediate plan on the dissemination and communication activities (T7.2)
Water stress and water vulnerability indicators and maps
A set of freely available country-wide GIS maps aimed at describing water stress, water vulnerability, food security risks, water reuse potential: one map for each target country and for each indicator referred to the onset of the project, and one referred to a 20-year projection. The report will include the identification of business opportunities for the European water industry related to the identified water vulnerabilities (T1.2)
Standard operating procedures and health / safety procedures relative to the wastewater treatment and irrigation technologies
"Standard operating procedures relative to the wastewater treatment and irrigation technologies, aimed at homogenizing the performance data, the optimized operational parameters and the output provided for the LCA and CBA (T2.1). For the technologies dealing with raw wastewater, the procedures will include (i) the adopted health and safety procedures in the respect of local, national and EU legislation, and (ii) the evaluation of the technologies' environmental impact and the measures taken to minimize it. This deliverable responds to Ethic Requirement 2 ""The applicant must ensure that appropriate health and safety procedures conforming to relevant local/national guidelines/legislation are followed for staff involved in this project"" and Ethic Requirement 3 "The applicant must provide further information about the possible harm to the environment caused by the research and state the measures that will be taken to mitigate the risks"."
Report on needs and priorities in the field of international cooperation agreements on water management in the target MACs
Identification of the needs and drivers for setting the priorities for agenda at the basis of international cooperation agreements in the field of water management in Egypt, Tunisia and Morocco (T1.1)
Effects of water stress on food security and socio-economic development
A report on the water stress effects on food security and socio-economic development for each target country, and two country-level food security risk maps (baseline situation and 20-year projection) (T1.3)
Final report on the dissemination activities and materials

Visual identity, promotion materials, online engagement with stakeholders, media activity, technical dissemination: final report. The deliverable will include the analysis of the dissemination activities as well as the actual dissemination materials (T7.5)

Final report on the water & crop allocation model

Final report on the development of the Water & crop optimization model, based on the current irrigation technologies (T3.3)

First report on the dissemination activities and materials

Visual identity, promotion materials, online engagement with stakeholders, media activity, technical dissemination: first report. The deliverable will include the analysis of the dissemination activities as well as the actual dissemination materials (T7.5)

Review of the use of economic instruments in water management in Egypt, Morocco and Tunisia

Review and assessment of the current status of IWRM and identified gaps in the target countries (T5.1).

Guidelines for the adaptation of the project outcomes beyond the project boundaries

Guidelines aimed at enabling the adaptation and implementation of the MADFORWATER tools, technologies and strategies for the evaluation and reduction of water vulnerability in other basins of the target MACs and in other MENA countries, including the training packages for the adaptation of the DSTs (T6.3)

WW management strategies and water & land management strategies in agriculture

Development of strategies, tailored for the 3 selected basins, for WW management and for water & land management in agriculture, including the related economic instruments (T5.2, 5.3)

Second update of the dissemination and communication plan

Final plan on the dissemination and communication activities (T7.2)

Dissemination and communication plan

Initial plan on the dissemination and communication activities (T7.2)

Integrated water & land management strategies and policy recommendations

Report on the development and assessment of integrated water & land management strategies for the 3 target basins, and policy brief with recommendations for action to address barriers and promote the implementation of the proposed technologies and strategies in the target countries (T6.1, T6.2)

Other (1)

Publications

Other (6)

Peer reviewed articles (30)

Monographic books (1)

Conference proceedings (1)

Book chapters (2)

Datasets

Datasets via OpenAIRE (48)

Software

Software via OpenAIRE (1)

Other Research Products

Other Research Products via OpenAire (1)

Relation to SCAR ARCH SWG PA scope

Scope and complexity: the continuum "research-innovation-impact-capacity building" with an international dimension, water management and its impact on agri-food systems, food security, new green businesses and jobs, empower local communities, interdisciplinary, transdisciplinary and multi-actor, comprising many geographical areas with a special attention to the EU strategic partnerships.

Overlaps and gaps of the project content compared to the other projects in the portfolio

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3. Small Fish and Food Security: Towards innovative integration of fish in African food systems to improve nutrition - **SmallFishFood**

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap-agri.com/?page_id=319
Project website: https://smallfishfood.org/

Funding details

Source of funding: EUHorizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)

Type of project (+ cluster if relevant): RIA - Research and Innovation action; LEAP AGRI Cluster 3 'Expansion and improvement of Agricultural markets and trade projects'

Contract number: LEAP-AGRI-282 (LEAP-Agri GA No. 727715)

Project total budget (€): € 1 000 000

Start and end date of the project

1 August 2018 – 31 August 2021

Project summary

The SmallFishFood consortium is a multidisciplinary research team from Norway, the Netherlands, Germany, Ghana, Kenya and Uganda, covering the fields of fish stock assessment, processing, marketing, nutrition, risk assessment and governance. It provides innovative rethinking of the food security discourse by focusing on the nutritional value of small fish (e.g. sardines). The aim is transformation into ecological sustainability and food security by asking: How can socio-cultural, economic and institutional transformations of the fish value chain, as well as technical and infrastructural innovations, contribute to improved, sustainable utilization of small fish resources for Africa's low-income population? The fact that the nutrients in fish can play a significant role in combating the triple burden of hunger, micronutrient deficiencies and non-communicable diseases is the starting point of the project. However, the unique qualities of fish are seldom recognized in the global food security discourse, and fish is strikingly missing from nutrient deficiency strategies among disadvantaged groups. Small fish are ubiquitous in all aquatic

environments from large marine ecosystems to seasonal ponds, as well as in market places and low-income household diets, but their significance is underrated and little understood as they are consumed locally and often go unrecorded in catch statistics. In fact, fisheries are the most energy efficient producers in comparison to other food production systems and have the least environmental impact in terms of greenhouse gases and use of freshwater, fertilizers, insecticides/ herbicides. Catching small fish, which are simply sun-dried and consumed whole, is the most high- yielding, eco-friendly, low CO2-emission and nourishing way of utilizing aquatic resources. However, a range of social, technical, economic and legal barriers inhibit the full potential of utilizing small fish and it is the aim of this project to contribute to solving these.

Project results

- ✓ Mass balance models of small fish value chains in Uganda, Kenya and Ghana have been produced and five MSc theses written.
- ✓ The main bottleneck in improving quality of processed fish is the limited value addition at the processing at the landing places (by women) due to lack of access to land and infrastructure.
- ✓ In Kenya KMFRI is developing an electronic catch recording/tracking system (App) via fishers.
- ✓ The strategies, agency, and constraints of fish processors and traders in terms of making livelihoods as well as producing and marketing high-quality small fish have been documented and the findings disseminated.
- ✓ 5 master theses are produced.
- ✓ To address the post-harvest and quality losses of mainly women in the processing and marketing nodes of the supply chain, training workshops have introduced processors to new cost-effective drying racks developed by CSRI-FR.
- ✓ Hammermills to produce fish powder were donated, and women were taught how fish powder can be used to fortify traditional dishes and new products such as biscuits, waffles, porridge, etc. Efforts were made to link fish processors with market actors requesting higher-quality products.
- ✓ Provided data on nutrient, contaminants, and microbiological quality of small fish in Kenya and Ghana. The nutrient data is part of an ongoing update of the INFOODS uFish data base. Data on mercury are included to be used in the ongoing update of the FAO/WHO risk benefit evaluation on finfish and shellfish consumption. Most of the data generated are made available open access through per-reviewed journal articles.
- ✓ Collaboration across countries lead to the development of a new methodology to establish if and how existing institutions and policies regulating fisheries and food security are biased against the role of SIS.
- ✓ Stakeholder engagement: Several stakeholder meetings and training workshops have been held in both Ghana and Kenya (see under project progress). Nutreco Africa/Skretting has been instrumental in getting access to fishmeal factories in Kenya. A start-up (Womega, Pyramidia ventures) working in Kenya on improving Dagaa quality in Kenya has had technical advice from our project.
- ✓ Capacity building: 4 PhD students and 18 master students from the University of Amsterdam, University of Bergen, University of Ghana and Wageningen University) have been working under supervision of the project's PI's to collect data and publish key findings of the project (see outputs). In 2019 the SmallFishFood project also played

a key role in a one-week summer school programme in connection with the MARE conference in Amsterdam on Fisheries & Food Security; several training workshop and information meetings with various stakeholders in both Kenya and Ghana.

- ✓ Communication: The project has communicated on all levels e.g. from international meetings and conferences, per reviewed journals, social media (homepage, Twitter and YouTube), local meetings and workshops and several newspaper articles. The project has gained international recognition in organizations such as FAO, WorldFish, IFAD, Rockefeller Foundation and USAID. Project results and challenges have been communicated in popular publications and in 4 short video's that have been disseminated widely.
- ✓ Monitoring & Evaluation of uptake Our engagement with multilateral organizations (FAO, CGIAR-WorldFish and IFAD), clearly show an uptake of our findings. E.g., our FAO Fisheries Technical Paper (Kolding et al. 2019. Freshwater small pelagic fish and their fisheries in major African lakes and reservoirs in relation to food security and nutrition), is already cited 66 times. The international project of Illuminating Hidden Harvest (IHH https://fish.cgiar.org/research-areas/projects/illuminating-hiddenharvests) has invited us to contribute to their reports.
- ✓ SmallFishFood is collaborating with 3 sister projects on fish and food security (Fish4Food and Ikan-F3, both funded by NWO-Netherlands; and DriedFishMatters, funded by SSHRC-Canada). A joint seminar at FAO in Rome (October 6, 2020) resulted in the preparation of a new high level FAO technical paper (work in progress). Our project served as a platform for an IFAD project titled Small Fish food and nutrition security from Lake Victoria, East Africa (SmallFishLakeVicEAC, budget 2.5 million USD).
- ✓ The SmallFishFood project contributes to the policy goals of poverty alleviation, food system stability and the prevention of environmental degradation in building poverty- and nutrition-sensitive management systems for African fisheries in collaboration with our partners.
- ✓ Assisting in developing more comprehensive (inter)national policies around fish-food systems and addressed policies that provide important contributions to combating hunger and malnutrition.
- ✓ The project has also generated a separately funded cross disciplinary PhD position at the University in Bergen, entitled "Small fish for small children: Dietary intake of small fish to reduce child malnutrition in Uganda". Most important lesson: How the focus on small fish has been positively received throughout.

Outputs WP2/3: Measures for value addition and longer shelf life of dried fish; technical improvements of processing and packaging; improved handing along the value chain. Processing and storage trials conducted; training workshop conducted; training material developed

Research Outcomes :1. Fish processors produce higher quality products. 2. Dried fish products are a healthy, attractive and affordable food. 3. Small fish as fortifier of cereal based product innovation by SMEs

Indicators 1. Reduced post-harvest losses and higher incomes. 2. New (urban) consumer groups buy high quality products based on small fish. 3. Increased usage of dried fish to fortify cereal-based products

Progress (per indicator): Financial net-benefits of processing improvements need to reach processors; Reaching to innovation up-takers is in process Reaching to innovation up-takers is in process.

Scientific and Socioeconomic Impact: Improved knowledge on value chains of processed small fish will increase awareness on the role of small fish in the food system. Increased consumption of high quality fish. Reduced malnutrition and micronutrient deficiency. Improved cognitive development and immune systems for infants. Improved public health for pregnant women and lowincome population.
Recommendation for upscaling More research on improvements in the value chains of small fish is needed using a participatory approach; acknowledgement of the different stakeholders in the value chain is needed; more trainings and investments are needed. Strong interaction with FAO and WordlFish on small fish which are increasingly recognized as important issue.

Lead partner

University of Bergen, Norway

Other partners

- Norway, Institute of Marine Research
- The Netherlands, Wageningen University and Research
- The Netherlands, University of Amsterdam
- Germany, German Federal Institute for Risk Assessment
- Ghana, University of Ghana
- Ghana, Council for Scientific and Industrial Research (CSIR) Food Research Institute
- Kenya, Kenya Marine and Fisheries Research Institute
- Uganda, National Fisheries Resources Research Institute

+10 Associate Partners

Contacts

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Relevant links

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Relation to SCAR ARCH SWG PA scope

Scope and complexity: the continuum "research-innovation-impact-capacity building" with an international dimension. The funding enables the team to embark on a large, long-term project in Sub-Saharan Africa, which takes its starting point from the fact that nutrients in fish can play a significant role in combating the triple burden of hunger, micronutrient deficiencies and non-

communicable diseases. The SmallFishFood consortium is a multidisciplinary research team from Norway, the Netherlands, Germany, Ghana, Kenya and Uganda, covering the fields of fish stock assessment, processing, marketing, nutrition, risk assessment and governance.

Overlaps and gaps of the project content compared to the other projects in the portfolio

There still many parts of the value chain that is little understood and many more small pelagic species needs to be analysed for FNS.
Topics still to be addressed (the knowledge gaps) Seasonal variation of nutritional value and safety; identification of critical steps for nutritional value and safety along the value chains; effect of different processing on nutritional value and safety; behaviour of consumers in the kitchen.
Topics still to be addressed (the knowledge gaps): Reduction of losses (quality, biomass and safety) along the value chains; Increased awareness raising of the role and potential of small fish; Technical improvements of fish processing; basic infrastructure on markets.

4. Developing capacities in agricultural innovation systems: scaling up the Tropical Agriculture Platform Framework **- TAP-AIS**

PROJECT INFORMATION

Source(s)

CORDIS website: https://library.wur.nl/WebQuery/leap4fnssa-projects/552
Project website: https://www.fao.org/in-action/tap-ais/en/;
https://www.fao.org/3/cb3762en/cb3762en.pdf

Funding details

Source of funding: Directorate-General for International Partnerships (DG INTPA), EU H2020 programme - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy,

Type of project (+ cluster if relevant): HORIZON 2020 RIA - Research and Innovation action; developed under the EU initiative "Development Smart Innovation through Research in Agriculture (DeSIRA): Towards climate-relevant Agricultural and Knowledge Innovation Systems".

Contract number: FOOD/2019/406-734

Project total budget (€): € 5 000 000

Start and end date of the project

1 August 2019 – 31 July 2024

Project summary

TAP-AIS is a project funded by the European Union and implemented by FAO. The project supports the Tropical Agriculture Platform (TAP) to strengthen capacities to innovate in national agricultural innovation systems (AIS) in the context of climate-relevant, productive, and sustainable transformation of agriculture and food systems in Africa, Latin America, Asia and Pacific.

The project objectives are:

i) strengthen the capacities of key AIS organizations to facilitate innovation processes for climate-relevant, productive and sustainable transformation of agriculture and food systems, and;
ii) strengthen mechanisms for improving policies and strategic processes.

The **TAP-AIS project is funded by the European Union (EU)** and implemented by the **Food and Agriculture Organization (FAO)** of the United Nations. https://www.fao.org/in-action/tap-ais/en/

The project evolves from the experience of the EU-funded Capacity Development for Agricultural Innovation Systems (**CDAIS**) project, which successfully tested and validated the **TAP Common Framework** on capacity development for agricultural innovation systems in eight countries (Angola, Bangladesh, Burkina Faso, Ethiopia, Guatemala, Honduras, Laos and Rwanda).

The objective of DeSIRA is to contribute to climate-relevant, productive and sustainable transformation of agriculture and food systems in low and middle-income countries.

DeSIRA supports research and innovation projects in Africa, Asia, Latin America and contributes primarily to the achievement of the following **SDGs**.

The TAP-AIS project expected impact is to contribute to promoting climate-relevant, productive and sustainable transformation of agriculture and food systems in low- and middle-income countries, in combination with other components of the DeSIRA Initiative.

The project outcome is "Strengthened capacity to innovate in national Agricultural Innovation Systems". To achieve this, the project is delivering four outputs:

✓ At global level, the project supports TAP governance and the TAP Capacity Development Expert Group, which has reviewed and is updating the TAP Common Framework (Output 1).

✓ At the national level, in nine countries, the project is strengthening capacities to innovate of key national organizations and platforms –innovation services providers– and is strengthening the enabling environment for agricultural innovation (Output 2). Such interventions would lead to improvement of national innovation policies. The results are shared with other actors and countries through the TAP.

✓ At regional and sub-regional level, the project promotes the use of TAP tools and approaches by African "CAADP ex-Pillar IV organizations", and regional research, education and extension networks and organizations in Asia-Pacific, and Latin America and the Caribbean (Output 3). The use of TAP tools and approaches would strengthen the capacities of these organizations to promote better research for impact and support innovative approaches to transform agrifood systems.

✓ Through information and communication platforms, the project is promoting and increasing awareness and knowledge among a large community of organizations and practitioners on using the TAP Common Framework on capacity development for agricultural innovation systems. The simultaneous use of these TAP tools and approaches in multiple countries enables cross-country learning and continuous improvement of the tools. (Output 4).

Project results

The project under **Output 1** has facilitated TAP Steering committee meetings (at least 3 per year) and three TAP Partners Assemblies (virtual events) in 2020, 2021 and 2023. Face-to-face events are executed, including the 10th TAP Partners Assembly in November 2023 in Addis Abeba, Ethiopia". The Capacity Development Expert Group has reviewed the TAP Common Framework and suggested revision to be made. A learning review of TAP was done in 2021 and the TAP

Engagement and Expansion Strategy was developed and is being implemented. The third TAP Action Plan 2022-2025 was developed and approved by TAP Partners in 2022. The TAP e-learning course is under finalization and due to be launched by November 2023.

At **country level** (**Output 2**), all **nine countries** have conducted assessments of their AIS and capacity needs assessment of selected organizations providing innovation support services. This led to the development of national roadmaps to strengthen national AIS in support of agrifood system transformation. Capacity development interventions (trainings, coaching sessions, bridging and multi-stakeholders meeting) have been organized or are ongoing. In Cambodia, Lao PDR and Rwanda the projects ended between December 2022 and June 2023. In the other countries activities are still ongoing (capacity development at organizational and policy level). In all countries the policy dialogue processes have started (and are completed in Lao PDR, Cambodia, Rwanda and Colombia). Several events were executed in 2023-2024 including **national policy dialogues** (in Eritrea, Malawi, Senegal and Pakistan), marketplace events and MEL workshops.

At **regional level** (**Output 3)** joint rapid appraisals were conducted in 2020 and action plans for the regional research and extension organizations were developed. The Regional Research and Extension Organizations (RREOs) are now implementing the action plans in the three regions. Main activities included: Training of Trainers (ToTs) in all three regions on applying TAP tools and approaches to strengthen AIS, publication of operational guide on the same topic (in Spanish, now being translated into English), a series of good practice notes (from Asia-Pacific and now coming out from Latin America and the Caribbean [LAC]); and regional working groups in LAC and Asia-Pacific on agroecology, higher education and biotechnology. Organization The FAO's Office of Innovation, which technically manages the Tropical Agriculture Platform (TAP) Secretariat, is implementing the project. Liaison with stakeholders throughout project implementation takes place at global, regional/sub-regional and national levels.

At **global level**, TAP Partners Assembly and TAP Steering Committee (SC) provide guidance and ensure alignment with the TAP Action Plan. Synergies and collaborations with other international organizations and networks, including IFAD and GFAR is ensured through the TAP. At national level, the project is working closely with FAO country offices and government organizations, country focal points of regional and sub-regional fora and with Agrinatura member organizations with relevant expertise in capacity assessment and development in line with other DeSIRA initiatives. The EU Delegations at country level and key national stakeholders, including government agencies, are closely engaged.

At **regional/sub-regional level** (**Output 3**), the project collaborates with FAO regional and sub-regional offices, with the African "CAADP ex-Pillar IV organizations" (FARA, AFAAS, ASARECA, CCARDESA, and CORAF), APAARI and APIRAS in Asia and the Pacific, and RELASER in Latin America and the Caribbean (all acronyms are expanded under the section "Other main stakeholders"). The project is also promoting and increasing awareness and knowledge sharing among a large community of organizations and practitioners on using the TAP Common Framework on capacity development for agricultural innovation systems. Implementing organization The Food and Agriculture Organisation of the United Nations (FAO)

Website: (Output 4) All communication, knowledge management and outreach activities of the project are published in the TAP website which includes news and publications, YouTube

channel for videos and webinar recordings, and the most recent activities are on Twitter. Updated on 19/09/2023

Lead partner

Food and Agriculture Organization of the United Nations (FAO), Italy
https://openknowledge.fao.org/server/api/core/bitstreams/293b684d-62db-45e3-adc2-498247c98f8f/content

Other partners

Actors of the agricultural innovation systems (government ministries, research institutes, universities, advisory service organizations, farmers' associations, NGOs, and private sector value chain actors and smallholders). CAADP ex-Pillar IV organizations (FARA, CORAF, ASARECA, CCARDESA), AFAAS, APAARI, APIRAS, RELASER, IICA. GFAR, Agrinatura and other Partners of the Tropical Agriculture Platform:

- Global Forum on Agricultural Research and Innovation (GFAR)
- Forum for Agricultural Research in Africa (FARA)
- African Forum for Agricultural Advisory Services (AFAAS)
- The Registered Trustees of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)
- Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA)
- West and Central African Council for Agricultural Research and Development (CORAF/WECARD)
- Asia-Pacific Association of Agricultural Research Institutions (APAARI)
- Asia-Pacific Islands Rural Advisory Services Network (APIRAS)
- Inter-American Institute for Cooperation on Agriculture (IICA)
- Latin American Network for Rural Extension Services (RELASER)
- Agrinatura

Location-Malawi; Pakistan; Burkina Faso; Eritrea; Cambodia; Honduras; Lao People's Democratic Republic; Rwanda; Senegal

Contacts

Research and Extension Unit, Office for Innovation, Secretariat of the Tropical Agriculture Platform (TAP), Food and Agriculture Organization of the United Nations (FAO), 00153, Rome, Italy
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Relevant links

TAP AIS at Capacity4Dev
TAPipedia

Relation to SCAR ARCH SWG PA scope

Scope and complexity: Actors of the agricultural innovation systems (government ministries, research institutes, universities, advisory service organizations, farmers' associations, NGOs, and private sector value chain actors and smallholders). CAADP ex-Pillar IV organizations (FARA, CORAF, ASARECA, CCARDESA), AFAAS, APAARI, APIRAS, RELASER, IICA. GFAR, Agrinatura and other Partners of the Tropical Agriculture Platform.

The TAP-AIS project builds on the Tropical Agriculture Platform approach and in particular on the experience of the EU-funded **CDAIS** project, which successfully tested and validated the **TAP Common Framework** on capacity development for agricultural innovation systems in eight countries from 2015 to 2019. For more information on the conceptual background of the project, see the key messages in the project brochure.

At the **operational level,** the TAP-AIS project intervenes at various levels: Global (**Output 1**), National (**Output 2**), Regional and Sub-regional (**Output 3**). The project also stresses the importance of the communication and knowledge sharing (**Output 4**).

Overlaps and gaps of the project content compared to the other projects in the portfolio

At regional and sub-regional level, rapid appraisals and identification of entry points for regional agricultural research and extension organizations in year one will inform a joint agenda for action, which the project will strategically support in the years 2-5. Awareness, knowledge exchange and communication activities will be implemented to reach out to more partners and stakeholders and promote the TAP Common Framework at global, regional and national level. Existing TAP tools will be revised and new ones developed to fill gaps in the knowledge tool box. TAPipedia (https://www.tapipedia.org/) will be supported, and linkages with other complementary knowledge platforms strengthened, such as TECA, will be made.

5. Understanding food value chains and network dynamics - VALUMICS

PROJECT INFORMATION

Source(s)

CORDIS website: https://cordis.europa.eu/project/id/727243/
Project website: https://valumics.eu/

Funding details

Source of funding: EU Horizon 2020 programme - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy; H2020-SFS-2016-2

Type of project (+ cluster if relevant): RIA - Research and Innovation action

Contract number: 727243

Project total budget (€): € 6 327 922

Start and end date of the project

1 June 2017 – 30 September 2021

Project summary

The overall objective of the VALUMICS project is to provide decision makers throughout food value chains with a comprehensive suite of approaches and tools that will enable them to evaluate the impact of strategic and operational policies, and enhance the resilience, integrity and sustainability of food value chains for European countries. The VALUMICS project offers a comprehensive and multi-dimensional scope that will go beyond the current state of art to provide new approaches and tools for stakeholders on several fronts. This includes new modelling approaches, consumer research, foresight analysis and synthesis into policy options, adding new perspectives for policy makers, both in government and within the food industry sector. The dynamics within the food systems will be modelled using a causal loop analysis framework, covering the interconnected value, supply, and decision chains.

The major objectives are:

- ✓ Develop approaches and tools to analyse the structure, dynamics, resilience and impact of food chains on food security, economic development and the environment.
- ✓ Explore the impact of public regulations (quotas, subsidies, public procurement policies etc.) and private initiatives (certification, Corporate Social Responsibility, marketing, retailer

standards, fair trade etc.), which have shaped these food chains to assess the conditions under which these interventions enhance or not resilience, integrity and sustainability.

- ✓ Analyse the suitability of selected indicators to capture the evolution of resilience, the sustainability and the integrity of a set of major food value chains across Europe, and their transformative capacity.

Project results

Specific outputs of the projects were:

Supply Chain Insights: Identified critical points in the food supply chain where waste occurs most, highlighting areas for targeted waste reduction efforts.

Consumer Behavior Impact: Explored how consumer choices contribute to food waste, informing strategies to promote more sustainable consumption habits.

Innovative Solutions: Evaluated new technologies and strategies to minimize waste, emphasizing cost-effective and environmentally beneficial approaches across the food value chain.

The overarching objective of the VALUMICS project to develop a comprehensive suite of approaches and tools to enable decision-makers to evaluate the impact of strategic and operational policies on the sustainability, resilience and integrity of European value chains has been fulfilled.

The project models and assesses the socioeconomic impacts and policy implications of two contrasting "transition pathways" of the European food system by 2030:

- ✓ A global market-led scenario which focuses exclusively on resolving climate issues, without questioning the general market dynamics of concentration/specialization processes underway in the food system. Decarbonization is carried out by the strictly necessary modifications in the political framework and the technical-economic organization.
- ✓ A local policy-led scenario which sets more ambitious and comprehensive objectives from the outset on all issues at stake (climate, biodiversity, health, employment) and envisages important shifts in the economic strategies of value chain operators.

The **two scenarios** are characterized through the changes implied in:

(i) the socio-political framework; (ii) consumer practices; (iii) industrial actors' strategies; (iii) production practices.

Two innovative models were developed (MoFOT and an ABM model) for the French wheat-to-bread/arable crops and dairy value chains.

In MoFOT, the impacts on three socio-economic challenges are assessed: (i) agricultural income, (ii) agricultural employment, (iii) and employment in the agrifood sector.

The results of the ABM – defined in terms of employment in agriculture and agri-food sector and in terms of FVC actors' gross margin - are compared to those of MoFOT to point out potential limitations and potential extensions.

The modelling results demonstrate that the global market-led scenario, which would not affect the dominance of the price competitiveness rationale among economic actors, has significant socio-economic impacts: a 10% reduction in agricultural jobs compared to current trend, due to

continuing concentration and an increase in the capital intensity of farms; a risk of income loss for farmers in the absence of compensation, especially because of increased debt levels; and job losses in the agri-food sector reaching 12% of current jobs.

The results of the **local policy-led scenario on the two value chains** studied support the plausibility of a just food system transition on the production side: agricultural jobs are up 10% compared to the business-as-usual trends, and income is maintained without any major constraints for subsidy levels or prices paid to producers; jobs in the agri-food sector increase by 7%, while offering more diversified and less processed foods.

It reveals what kind of policy interventions needed at three complementary levels to foster changes in (i) consumer demand; (ii) market organization; (iii) agricultural production.

The comparison between both scenarios shows that limited political change, aimed only at the supply side – as in the global market-led scenario – does not address the employment issues of the transition, and is particularly inequitable on the consumption side. Intervening on the demand side and on market organization thus appears to be a determining factor in achieving a fair transition of European food value chains.

The results of the VALUMICS research involving FVC stakeholders and experts, emphasize that transformation must be supported by food system actions involving all food value chain actors, from farmers to processors, retailers, and consumers with an emphasis on a wider perspective of food system analysis and policy integration. Food system transformation highly depends on the collaboration and cooperation of FVC actors which is where the issue of fairness plays an important role since actors are less likely to collaborate and coordinate activities when they perceive themselves to be impacted by unfair trading practices.

The simulation model is designed to assess the impact of intervention strategies e.g. for food value chain actors in future scenarios and how this may influence the gross profit margin and level of employment. An example is the implementation of regulations or policies such as the Farm to Fork strategy which is set to influence transitions and enhance the sustainability of European food systems. The outcome of the consumer behaviour studies provides policy makers and food industry actors with a range of evidence-based approaches and recommendations to drive more sustainable food purchasing and consumption behaviours. Behaviourally informed policies or action plans should be conceived as a complementary approach to policies and strategies with the potential to foster enjoyment, innovation, and public acceptance in the transition to more sustainable eating behaviour.

Anticipatory future food value chain scenarios is a way to explore of the influence of different strategies and policies. Given the numerous studies today on FVC transformations towards more sustainable and resilient futures, the novelty of the VALUMICS scenario exercise is twofold: (i) it is the first exercise that explores how food chains could be reorganized to meet the environmental objectives set by sustainable food system scenarios.

The focus in earlier studies has so far been on consumption and primary production largely overlooking the numerous actors in FVCs between farmers and consumers, as well as, impactful socio-economic dimensions such as fairness, resilience, and job provision; ii) the VALUMICS scenario exercise goes beyond the characterization of an "end point" by 2050 by addressing the question of "how to get there?" This includes characterization of transition pathways up to 2030 which account for social and political processes at play in the transition. The outcome

demonstrates that the economic viability of a "just transition" of the food system will depend on major policy changes.

The results have been published and disseminated through scientific publications, international conferences, workshops, and webinars. The outreach and dissemination have raised public awareness of the project via social media campaigns and the project website.

Lead partner

HASKOLI ISLANDS, Iceland

Other partners

The consortium driving the VALUMICS project has a core of 19 European partners from 14 countries, and two Asian partners. Partner details: https://valumics.eu/the-project/partners/

Contacts

HASKOLI ISLANDS, Iceland - Dr Sigurdur Bogason
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Relevant links

- PROJECT BRIEFS
- Policy & Governance
- Food System Case Study Groundwork
- Foresight analysis
- EU policies promoting Fairer Trading Practices, Food Integrity, and Sustainability Collaboration along European Food Value Chains
- The Governance of European Food Value Chains
- Towards a Sustainable and Fair EU Food System: Challenges and Conditions of a Protein Transition
- Policy conditions for a just transition of the French dairy and wheat sectors
- Norwegian salmon value chain: Flow of products and decision mechanisms
- Role of the regional policies in multi-level governance of agri-food value chains: Emilia-Romagna
- Market orientation: Dairy value chain in Germany, France and UK Food Chain Impact: Market matters
- Profitability in the European food industries
- Novel Solutions for Food Chain Climate Impact Reduction
- Norwegian salmon value chain: how does it influence the EU markets?
- Italian processed tomato value chain: market competitiveness, efficiency, and pricing mechanism

All direct links can be found here: https://valumics.eu/outcomes/

Relation to SCAR ARCH SWG PA scope

Scope and complexity: The project work addresses specific challenges facing the food system and food value chains in Europe and Asia. The key role of the food system in the European economy and society is to ensure food and nutrition security, contribute to local and global economies, provide jobs and as a result has a significant impact on the sustainable development of food value chains. The project will implement a holistic approach and causality based system framework analysis, supported by new advances in theory, modelling and data gathering, which is required to capture and understand the dynamics and interactions in food systems from providers of farm inputs to consumers, including the waste managers and policy makers.

Overlaps and gaps of the project content compared to the other projects in the portfolio

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6. Innovative approaches to value addition and commercialization of climate smart crops for enhanced food security and nutrition in Africa and beyond - **NUTRIFOODS**

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap.iamb.it/?page_id=329
https://www.facebook.com/people/Leap-Agri/100064422413040/?ref=embed_page
https://www.wur.nl/en/project/nutrifoods-an-african-european-partnership-to-develop-climate-resilient-bread-products.htm
K4P website: https://knowledge4policy.ec.europa.eu/projects-activities/nutrifoods-innovative-approaches-value-addition-commercialization-climate-smart_en

Funding details

Source of funding: EU Horizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)

Type of project (+ cluster if relevant): H2020 RIA - Research and Innovation action; LEAP-Agri cluster 4 'Multi-sectoral projects'

Contract number: LEAP Agri GA No. 727715

Project total budget (€): /

Start and end date of the project

1 September 2018 – 29 November 2022

Project summary

Rural communities in Africa, traditionally prepare meals from locally grown crops like cassava, sorghum and pulses. However, with fast population growth, massive urbanization, and increasing disposable incomes, consumption of wheat breads is increasing rapidly and displacing traditional meals. The bread products available to consumers, though tasty, are not nutritionally balanced. Besides, wheat is almost wholly imported and is expensive. Conversely, in Europe, wheat-based breads have a large share in traditional consumption. However, the

increased prevalence of coeliac disease, gluten sensitivity and irritable bowel syndrome in Europe, has created a growing demand for high quality gluten-free products. Climate-smart food crops (CSFC) namely cassava, sorghum, finger millet, amaranth and cowpeas are well positioned to provide solutions to the above challenges.

NUTRIFOODS aims **to enhance food and nutrition security and improve livelihoods of stakeholders in the CSFC value chain** while favouring local economies. The project approach involves market appraisal, processing of CSFC to nutritionally rich and functional bread ingredients; and using the resulting ingredients to develop and pilot produce high quality wheat-reduced and gluten-free breads that meet consumer preferences. The project uses commercialization and business incubation as a pathway to deliver nutritional and socio-economic gains to the target beneficiaries. Additionally, it contributes to better and sustainable research and development capacity in the CSFC value chain in partner countries.

OBJECTIVES:

NUTRIFOODS seeks solutions on how to increase the use of Climate Smart Food Crops (CSFC) in baked products to provide nutritionally-rich food that meets consumer needs while favouring local economies. In Africa, rural communities traditionally prepare meals from locally grown crops like cassava, sorghum and pulses. However, with fast population growth, massive urbanization, and increasing disposable incomes, consumption of wheat breads is increasing rapidly and displacing traditional meals. The bread products available to consumers, though tasty, are not nutritionally balanced.

NUTRIFOODS addresses the technological and human skills issues to enable the successful manufacture and uptake of nutritious, wheat-reduced and gluten-free breads in Africa and Europe.

Project results

Project activities:

- Identify consumer needs and key limitations in the supply and market chain of CSFC;
- Develop high quality functional ingredients from the CSFC to be used in palatable breads;
- Use the functional ingredients in pilot-scale breads tailored for African and European markets;
- Identify business opportunities in the CSFC value chain and nurture SMEs to commercialize the developed technology;
- Inform policy makers and disseminate the developed technologies for harnessing of CSFC.

Major Outputs / Results:

Outcomes:

- Increased acceptance of gluten-free and wheat reduced breads from CSFC
- Commercial production of functional bread ingredients from CSFC

Impact:

- Increased market opportunities for CSFC with benefits accruing to small holder farmers.
- Increased business and job opportunities in the CSFC value chain.
- Effective and sustainable CSFC value chain that benefits the various stakeholders.

Approach & Impact

NUTRIFOODS **aims to build new value chains for CSFC in SubSaharan Africa through a market-driven approach**.

The key strategies to achieve this are: i) to develop functional ingredients with properties that allow partial or full replacement of wheat in bread products by using CSFC; ii) understanding the supply and market chain of CSFC by addressing their limitations; iii) using markets as key incentivizing drivers of value chains; iv) engaging commercial partners to enhance technology uptake and commercialization

The project **outputs** lead to market uptake for new, safe, nutritious, palatable and convenient staple bread products for European (gluten-free) and African (wheat replacement) consumers.

Technology to create functional ingredients from CSFC opens new business opportunities along the CSFC value chain in Africa, thus having a positive contribution to employment and wealth creation. This leads to the increase of the utilization and demand for these crops.

Opportunities and challenges

The NUTRIFOODS consortium is multidisciplinary with a strong food technology and business focus. Market-driven technology push with experienced commercial partners and SME incubators offer chances for sustainable economic impact.

The strong technological focus should be balanced with communication activities towards other stakeholders e.g. policy makers to broaden the impact, e.g. high-aerated tin breads require highly functional ingredients to replace wheat to meet consumer requirements. Low-provision flat breads may well fit to modern consumers in different markets.

Research component (from basic to finalized) and research advancements

Consumer and market research

In view of the market-driven approach, NUTRIFOODS started by identifying the consumer needs for attractive CRC-based products and key limitations in the CSC supply and market chain. A Rapid Market Appraisal (RMA) methodology was developed as an effective instrument for African SMEs to perform small scale market research to identify market opportunities for new products, market barriers and possibilities to enhance productivity tuned to regional contexts.

Improving CRC functionality

Results indicate that African consumers and value chain actors are hardly aware of gluten-free or wheat-reduced bread products and their possible health and economic benefits. The challenges and opportunities for the CRCs were also analyzed at food system level. This analysis showed that a substantial increase in the cultivation and consumption of CRCs should lead to considerable nutritional, economical and sustainability improvements in the sub-Sahara African food system. CRCs have in common that they lack technologic functionalities and properties to effectively compete with wheat flour.

Various processing technologies are applied to improve the functionality of sorghum and cowpea. Treatments like fermentation, extrusion, roasting and malting are employed to improve chemical and physical parameters (starch pasting properties, protein denaturation and gelling, hydration and rheological properties) related to the techno-functionality of the flours, and improve their functionality to produce high quality breads. The treatments are also used to improve the sensory properties of the breads in terms of flavour and texture.

Furthermore, the functionalities of CRCs for producing bread products were investigated. A very important insight was that mixtures of CRCs proved to offer broader opportunities for optimization of technological and nutritional properties compared to single crops for wheat

replacement. A highly versatile mixture of sorghum, cowpea and cassava was developed and successfully demonstrated in various product concepts in different markets: In the conditions of a Dutch industrial bakery, gluten-free breads were developed, which can provide export opportunities for CRC ingredients to Europe. In formal Ugandan bakeries CRC based tin breads were developed. First consumer tests were very promising. In the local situation at street vendors the CRC formulation was demonstrated to provide highly attractive and satiating chapatis for low-income consumers. Current implementation and commercialization of results focusses on setting up supply chains and development of consumer products. Promotion of the use of local crops and added value food production in Africa can contribute to a more resilient food system.

Product development and commercialization

Together with the industrial partners, the consortium partners developed ingredients and bread products for African as well as European markets, and ensured that the results of the research are applied and lead to economic development.

A combination of sorghum, cow-pea and cassava is more affordable compared to imported wheat and provides a highly nutritional product with proteins, dietary fibres and micronutrients.

Various products like chapati and tin breads successfully produced in practice and now are commercialized.

The project team **communicated** the research outputs in 21 peer-reviewed scientific articles as well as at least 30 posters and paper presentations. Scientific dissemination included guest editing of a Special Issue in the scientific journal 'Foods' titled "Current Advances in the Science of Gluten-Free and Climate Resilient Crops for the Purpose of Sustainability, Food Security and Nutrition". The project partners in Europe and Africa engaged actively and exchanged on research matters. Research insights, methodologies and protocols were actively exchanged, discussed and shared among partners. The project build research capacity. At least 40 students at different levels received training or research opportunities. The research projects of a total of 17 BSc, 15 MSc and 8 PhD students were supported by the project. The uptake of the research outputs currently focusses on fostering the implementation and commercialization of NUTRIFOODS results by our commercial project partners as well as new business contacts who are setting up supply chains and developing consumer products.

The Nutrifoods project empowered a large group of **young people** (students) in Uganda, South Africa, the Netherlands and Finland to pursue postgraduate studies on topics related to a sustainable supply of food in the form of ingredients and bread-type products. The training and research opportunities contribute to capacity development in the countries. Furthermore, many scientific and entrepreneurial tools, protocols and methodologies were developed and shared within the (young) scientists and students in the consortium and a workshop for young students/entrepreneurs was organized in South Africa.

Lead partner

Makerere University, Uganda

Other partners

- ✓ Wageningen University & Research (WUR), The Netherlands
- ✓ Kenya Industrial Research and development Institute (KIRDI), Kenya
- ✓ Technical Research Center of Finland Ltd (VTT), Finland
- ✓ University of Pretoria, South Africa
- ✓ University of Venda, South Africa
- ✓ Nutreal Ltd, Uganda (SME from Uganda marketing healthy bakery products)
- ✓ Bake Five BV, The Netherlands

Contacts

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S. Renzetti - Wageningen University, The Netherlands stefano.renzetti@wur.nl

Relevant links

- Download: Bread Products from Blends of African Climate Resilient Crops: Baking Quality, Sensory Profile and Consumers' Perception
- Download: Effect of Bioprocessing on Techno-Functional Properties of Climate-Resilient African Crops, Sorghum and Cowpea
- Download: Current Advances in the Science of Gluten-Free and Climate Resilient Crops for the Purpose of Sustainability, Food Security and Nutrition
- Download: Dry Heating of Cowpea Flour below Biopolymer Melting Temperatures Improves the Physical Properties of Bread Made from Climate-Resilient Crops
- Download: Towards Sustainable Shifts to Healthy Diets and Food Security in Sub-Saharan Africa with Climate-Resilient Crops in Bread-Type Products: A Food System Analysis

Relation to SCAR ARCH SWG PA scope

SCOPE AND COMPLEXITY**:** The project is an R&I action is an Europe-Africa cooperation on food systems transformation in a context of climate change, focused on the transformation of agrifood systems (from primary production to diets).

Thematic area of the project:

- Sustainable food security
- Nutritious value chain
- Food Value chain

Policy relevance is embedded in the research: NUTRIFOODS project provides tangible interventions to promote the use of local crops to reduce Africa's dependency to imported wheat and improve the resilience of the food system. The implementation can contribute to food and nutrition security and bring economic activities for work and employment throughout the supply chain from farmers to food processing and food producers including street vendors, all within a sustainable context. Although the implementation relies primarily on private actors, policy makers could foster and speed-up the implementation in many African countries.

The team already did so by actively approaching policy makers and NGOs throughout the project with presentations in specific meetings and conferences, bilateral meetings and round table discussions. These disseminations led already to many (African) scientists and organizations showing interest in CRCs and potential collaborations on continuation and implementation.

UP, MAK and VTT researchers are collaborating in EU project INNOFOODAFRICA http://innofoodafrica.eu/ to explore climate-smart African crops in Ethiopia, Kenya, South Africa and Uganda. The project addresses the key barriers of the African ago-food system, i.e. low productivity, limited access to urban and international markets, affordability and convenience of the foodstuffs.

NUTRIFOODS approach and product concepts were used in NOURICITY workshops in Uganda. Contribution of the NOURICITY team to the Food System Analysis position paper of NUTRIFOODS.

Food Security, Food Safety, Nutrition & Poverty Reduction

The project developed bakery solutions using climate-resilient crops for implementation and use by entrepreneurs in Uganda, South Africa and European countries. In Uganda, solutions were tested at an established bakery and also as ready-to-use options by street vendors. Street vendors serve a strategic role in terms of convenient food supply for the urban population, and more particularly the low-income consumers. The project provided opportunities to push for an increase in the supply of local raw materials (sorghum, cowpeas and cassava) from climate-resilient crops thereby promoting sustainable agriculture in Uganda and South Africa. The raw materials are to replace the reliance on imported wheat and are to be used in bakery products with the aim of improving the diet of the target populations. The project provided alternative solutions to replace the use of imported wheat and to stimulate the utilization of locally produced food crops for staple food (bread) production. Some of the products have the potential to address nutritional needs for protein and micronutrients of adolescent girls, pregnant and lactating women and older persons.

Gender balance

Female students working on the Nutrifoods project comprised 73% of the total number of students in the project. Women researchers were the majority of the supervisory team. Women make up the major part of the active small-scale farmers responsible for growing the target food crops in African countries and are a significant part of the workforce involved in the processing

of the food crops, bakery product manufacturing sector and sales sectors whether formal supermarkets or informal street sales

Overlaps and gaps of the project content compared to the other projects in the portfolio

Valorisation of climate-resilient crops and technologies

The results indicate that the formulation approach provided is versatile. Several exchanges of different cultivars or ingredient grades in the recipes resulted in good quality products. However, flexibility to adopt a wider variety of local crops depending on their local availability and price should be pursued in further research into the functional properties of a wider variety of climate resilient crops, to valorise their use. These activities could go hand in hand with co-creation processes with local food processors making use of local knowledge and traditions and involve local consumers to effectively guide development of local food supply chains in Africa.

Collaboration with the LEAP-Agri consortium as a whole

Due to the challenges with the process of national funding for some of the project partners cohesion in terms of research progress and commitment to timelines has been a challenge. The project may have had benefited more if the details of partner contributions had been identified and communicated earlier in the process. It is extremely difficult to co-create research processes if partners do not have access to funding at the same time. The funding issues have a substantial effect on the NUTRIFOODS project. Within this complex situation, the communication of LEAP-Agri team was very detailed, explaining the situation in a wider context, which was very helpful and encouraging for the NUTRIFOODS project team. Furthermore, the offered guidance, flexibility and pragmatism is highly appreciated. The LEAP-Agri consortium as a whole has been very understanding and supportive particularly on issues regarding delayed disbursement of project funds.

Capacity building

Agricultural produce is one of the most important industries and trade in sub-Saharan Africa. For this, well-trained researchers and individuals are required that can assist to increase and scale-up agricultural productivity. The major part of added value lies in the upstream processing of food products and supply to the consumer. The latter was the skills development focus of the Nutrifoods project. Much more need to be done to empower smallholders and small and medium-scale enterprises to contribute more effectively to agro-processing to the bakery supply chain. Informal markets and street foods still constitute the largest part of daily urban food consumption in many sub-Saharan Africa countries.

7. Co-innovations across scales to enhance sustainable intensification, resilience, and food and nutritional security in water-managed agricultural systems in West Africa - **WAGRINNOVA**

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap-agri.com/?page_id=277
Project website: https://wagrinnova.csic.es/

Funding details

Source of funding: EU Horizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)
Type of project (+ cluster if relevant): H2020 RIA - Research and Innovation action; LEAP-Agri cluster 1 'Sustainable Intensification projects'
Contract number: Grant PCI2018-093051 (LEAP-Agri GA No. 727715)
Project total budget (€): € 1 105 880

Start and end date of the project

1 September 2018 – 31 August 2022

Project summary

The development of irrigated and improved lowland agriculture in Western Africa (WA) has not resulted in a significant increase in food security or in a motor for economic growth, in spite of its large potential and the great benefits observed in other regions of the world. When successful, irrigated agriculture reduces crop failure, increases cropping diversity and land productivity, contributes to balanced nutrition and to develop food markets and agroindustry, and generates employment; conversely, it has environmental implications.

WAGRINNOVA aims at **deepening on why irrigated agriculture has not resulted in the expected impact in Western Sahel, and at setting the basis for changing** this, particularly now that there is a revival of investment in rehabilitating abandoned or degraded irrigated land. It uses a multiscale approach and participatory action research for characterising and benchmarking current conditions, for co-designing innovations and developing environmentally-friendly and economically-viable systems adapted to local conditions in

innovation hubs. These activities are accompanied by the required capacity building with special attention to the participation of youth and women in the opportunities brought by crop diversification and ICT tools. The consortium, integrated by **five African institutions**, five European, and five associate partners, aspires to change the development paradigm for irrigated and other water-managed agricultures in WA and identify environmental-friendly systems in WA and Spain.

OBJECTIVES:

The **research objective** is **a systemic multidiscipline multiscale evaluation of water-managed systems** to identify their constraints, potential and enabling environment that leads to sustainable intensification through appropriate technical and governance solutions, and market-oriented crops.

The **innovation objectives** are:

- Simultaneous multiscale interventions based on participatory approaches, to override production, organizational, environmental and socio economic constraints.

- Strengthening collective capabilities to improve governance and sustainable water use.

-Empowering women and youth by bringing opportunities derived from new crops and ICT tools.

- Strengthening West African research and technical potential by boosting researchers and graduate's capacities and by enriching existing partnerships.

- Fostering win-win situations between the agricultural sector and irrigation developers.

- Providing essential information for policy orientation and formulating relevant related recommendations.

Project activities:

The irrigated and improved lowland agricultural systems are not resulting neither in a significant increase in resilience and food security for smallholders nor in a motor for economic growth in West Africa (WA). However, the potential benefits of water-managed agricultural systems are enormous in WA. Irrigated agriculture increases cropping intensity, diversity and productivity; contributes to develop food markets and agroindustry; and generates employment; conversely, it has environmental implications. It is hypothesized here that Sustainable Intensification (SI) of watermanaged agricultural systems is the pathway to a new, dynamic, inclusive, market-oriented, technology-based agriculture. SI is not achieved through stand-alone technology but by combining technologies and governance to design productions systems that are best adapted to local conditions.

The **consortium**, integrated by five African institutions (SARI and UDS, in Ghana, ISRA and UGB in Senegal, and INERA in Burkina Faso), five European institutions (IRD and CIRAD in France, WUR in The Netherlands, CIHEAM-Bari in Italy, and CSIC in Spain, the coordinator), and five associate partners (CILSS, AECID and three companies), envisions SI as the springboard that will transform irrigation and lowland communities into resilient, food-secure communities improving their wellbeing through economic growth.

The project aspires to change the development paradigm for irrigated and other water-managed agricultures in WA and identify environmental-friendly systems in WA and Spain. The identification of current performance gaps and benchmarks and of a new set of SI solutions will be followed by co-innovation within the project innovation hubs, working simultaneously at different scales (from plot to scheme/improved lowland system). These

hubs, where women and youth will be preferred target adopters, will catalyze the change in their respective areas of influence, with a multiplier effect supported by an ICT platform.

Task 2. Understanding current conditions in Innovation Hubs (Leader partner: ISRA)
Establish baseline conditions through semi-structured interviews.

Task 3. Tools and guidelines to support innovation (Leader partner: IRD)
Develop or adapt tools for the sustainable intensification of water managed agriculture systems and of methodology guidelines to support action research in the hubs. Teams and stakeholders will be trained on their use in Task 7.

Task 4. Co-innovation processes in the hubs (Leader partner: UGB)
Multi-stakeholder collaboration to evaluate and improve innovations in the hubs at different scales (plot, scheme/watershed) based on findings in Task 2.

Task 5. Identification of enabling environment for sustainable intensification (Leader partner: INERA):
Global analysis of Task 2 and Task 4 for the identification of the best performing local strategies and elements that lead to successful SI, and for the appropriate dissemination of innovations.

Task 6. Knowledge sharing and research uptake (Leader partner: CIRAD)
Elaborate the Plan for knowledge sharing and research uptake and communication material, and to promote outscaling and effective dissemination of results, tools and guidelines.

Task 7. Building capacity (Leader partner: UDS)
Training of participants with particular interest in encouraging women and young researcher

Project results

Wagrinnova's used a multi-stakeholder, -scale and -discipline approach in **7 innovation HUBs** organized in: Burkina Faso (2), Senegal (2), Ghana (2), and Spain (1), in community-managed irrigation schemes (IRRI) and regulated or rainfed lowland (LLV) valleys Based on the main constraints and opportunities identified in the targeted systems, co-selected innovations to address them were evaluated in the field. In parallel, tools and guidelines were prepared to support the co-innovation process, and targeted stakeholders were trained. The co-innovation process led to co-design adequate practices in a context of climate change and food insecurity, and provide the ground for advising farmers, developers, and policymakers.

The **diagnostic phase** involved participatory action research, based on a harmonized framework. Baseline studies served to identify the constraints and opportunities of the targeted systems at different scales together with an inventory of potential innovations and tools to address them (Basket of innovations), and complemented by a literature review. In the co-innovation phase, selected innovations (23 tools and practices) were co-evaluated, e.g. adapted rice varieties, crop diversification, nutrient management, plot and collective water management, monitoring and forecasting. In parallel, tools (9) and guidelines (4) were developed/adapted to support the co-innovation process. Field days (14; 475 participants) and impact assessment served to validate /improve options. Emphasis was put on capacity building throughout the process, targeting diverse stakeholders: 28 on-site and technical trainings (681 trainees (ca 50%F), 5 PhD (2F), 26 (8F) Master students, 5(1F) technical trainees, and 3 African women completed the CIHEAM MSc on water management. The project gender-inclusive approach could not be implemented as its leader UDS was affected by lack of funding up to 2021. In its place, 2 site-specific gender studies were carried out in Ghana (D3.1) and emphasis was placed

on gender inclusion notably in training and dissemination activities. Travel restrictions due to COVID-19 (all countries) and security reasons (Burkina Faso) were major obstacles for the progress. Meetings and thematic webinars were then regularly organized, and other activities reoriented to online format (6 specialized webinars, average 28 participants). Additionally, the 2-y delay for approving the 1-y extension made planning difficult. Despite this, main findings were largely disseminated according to the Plan of Knowledge sharing & research uptake: website; workshops & farmers sessions (28); video, radio, press-release and social media (28); articles (12 published, 5 under review); conferences (14). Some work is in progress to highlight the elements towards the sustainable intensification of targeted systems in the region (e.g. Policy briefs).

The project **outcomes** are:

- Enabling environment for SI (# policy/decision makers sharing outcome; performance gaps map; # enterprises for SI);
- Women and young practitioners leading the SI process (# women and young practitioners involved in the SI process);
- Adopted on-farm technologies for SI (# new technologies adopted in innovation hubs; multiplier factor);
- Sustainable use of agricultural water, energy, land and inputs (increment in productivities in hubs; multiplier factor);
- Increased productivity, diversification, market-oriented ag production (increment of production, products and income in hubs; multiplier factor);
- Irrigation scheme/lowland valley organizational models in place (adoption of improved organizational models in hubs);
- Network to support upscaling through an ICT platform (accesses and use from hubs and elsewhere).

Expected **impacts** include:

a) Improved wellbeing and more resilient small farmer households and communities by identifying the enabling environment, training and adopting technologies leading to SI, and by women and youth profiting from new opportunities offered by SI, including market-oriented crop diversification and use of ICT tools;

b) Improved sustainable use of agricultural water and soil resources, and increased awareness of environmental issues, by improving organizational models in irrigation schemes and lowland production groups, applying tools to improve crop, nitrogen and water management, capacity building and adopting technologies leading to SI;

c) Enhanced capacity for SI by on-site training, short specialized training and postgraduate education, tested guidelines and tools to support SI, network to support upscaling through an ICT platform and knowledge-based policy recommendations.

ROP App

The DROP app aims to provide smallholder farmers with actionable information on expected rainfall and soil moisture on a daily, 7-days, 14-days basis.

Where to get? *Google Play Store (Access only thorugh application with WUR)*

For whom? *Rainfall dependent smallholder famers*

Output? *1 to 14 days rainfall forecasts and 1 week soil moisture forecasts*

Contact: spyros.paparrizos@wur.nl

More information: Sutanto et al. (2022); www.waterapps.net

Rainsat Apps

Rainsait mobile apps allows users to access timely and regional/country-specific rainfall estimates for the past 24 hours and forecasts for the next 3 hours. Such information on rain expectations is crucial for short-term decision making even at farm scale.

Rainsat apps provide more accurate and detailed near real-time observations and short-term rainfall forecast information that enables farmers to make better informed decisions on irrigation, when to apply fertilizer, or to spray or sow. This information reduces the chance that newly planted seeds or recently applied fertilizer is washed away as a result of a heavy rainstorm.

Contact : lugt@hkv.nl

CalCul

This simulation software allows the construction, at the scale of a whole irrigation scheme, of a provisional calendar of cultivation operations for a rice crop according to the variety, date and planned mode of implantation. This calendar is optimal for the crop and takes into account the duration of the work carried out collectively on the scheme.

Contact: jean-christophe.poussin@ird.fr

To know more about

it: https://www.sciencedirect.com/science/article/pii/S0308521X05001927

Irrigation scheme water distribution

This training tool is particularly oriented to facilitate comprehension of the water delivery concepts and their implementation in schedules according to their delivery modality.

Contact: luciano.mateos@ias.csic.es

CropET

This tool is oriented to the calculation of irrigation amounts taking into account crop, water and irrigation system characteristics.

Contact: fvillalobos@uco.es; alopez@ias.csic.es

To know more about it: https://www.uco.es/fitotecnia/cropET.html

FertiliCalc

This tool is oriented to the calculation of N, P and K fertilizer rates by farmers and agronomists.

FertiliCalc is a program developed at IAS-CSIC and Universidad de Cordoba to help in calculating N, P and K fertilizer rates. It also provides estimates of soil acidification and N losses. The smartphone version (Fertilicalc 4.0) includes 18 languages.

This program is being used as a teaching tool in several universities around the world. It's also the basis for several fertilizer calculation apps developed by public institutions in Spain.

Contact: fvillalobos@uco.es; alopez@ias.csic.es

To know more about it:

https://fertilicalc.com

https://www.uco.es/fitotecnia/fertilicalc.html

Sim DCN

This simulation tool aims to support the design and management of the water structure made of contour bunds (DCN stands for Diguettes en Courbes de Niveau) in the rice-based lowland systems.

Contact: jean-louis.fusillier@cirad.fr

ODSIS Tool

The Optimal Design of Solar Irrigation System (ODSIS) is a solar pumping system sizing tool for small farms (off-grid and on-grid) in all areas.

This tool was developed under the collaboration between the Institute of Sustainable Agriculture (AIS-CSIC), the University Gaston Berger of Saint-Louis (UGB) and the University of Cordoba (UCO).

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On-site & technical training

On-site training carried out within the framework of the Wagrinnova project

On-site training is provided at the different working scales and for all participating stakeholders, encouraging the participation of women and youth. Local workshops for training of hub teams on approach, methods and tools are also considered.

Technical & degree training carried out within the framework of the Wagrinnova project

2019/20

- Meda Dondeterlé, J., 2020. Pratiques et économie féminie dans les bas-fonds rizicoles. Cas de Bankandi et de Kankaniba. IRD-Burkina Faso. Mémoire présenté en vue de BTS, CAP Matourkou.

2020/21

- Hien Naab, P., 2021. Gestion intégrée de la fertilité dans les bas-fonds aménagés rizicoles (Dano) en fonction de situations diversifiées. IRD Burkina Faso. Mémoire présenté en vue de BTS, CAP Matourkou, 45p
- Kadja Yelignisse, B.F., 2021. Adaptation, amélioration et réhabilitation d'ouvrages rizicoles de BF (région Dano). IRD Burkina Faso. Stage License 3 GEAAH, 2IE, 38p

2021/22

- Mamadou Zampaligre. Diagnostic du parc arboré des bas-fonds et propositions pour une agro-foresterie de bas-fond. Cas de Dano. ENF Bobo-Dioulasso, Burkina Faso.
- Traoré Jean-Baptiste, ENAFA Matourkou, Burkina Faso

Online courses

WEBINAR SERIES on "**Agriculture Water in the Sahel**" | **20 April -26 May 2022**

Short talks on relevant research topics in water-managed systems by smallholder farmers. Organised by UGB (Senegal), UDS (Ghana), CIHEAM-Bari (Italy) and CSIC (Spain)

Session 1. DSS for smallholder farming in Sub-Saharan Africa | 20-21 April 2022

Moderator: Gordana Kranjac-Berisavljevic, UDS, Ghana

- FarmerSupport App. Rainfall forecasts tailored to farmers' needs. Spyros Paparrizos, WUR, The Netherlands | 20 April 2022
- AQUACROP for supporting smallholder irrigation decisions. Marga García-Vila, CSIC, Spain | 21 April 2022

Session 2. Management of smallholder irrigation | 19-20 May 2022

Moderator: Bilal Derardja, CIHEAM Bari, Italy

- Performance assessment of smallholder individual irrigation. Lamine Diop, UGB, Senegal; Luciano Mateos, CSIC | 19 May 2022
- Solar irrigation. Wahid Fouial, CIHEAM-Bari, Italy | 20 May 2022

Session 3. Water Resources | 25-26 May 2022

Moderator: Sidy Seck, UGB, Senegal

- Groundwater for supplementary irrigation. Elie Serge Gaetan Sauret, INERA, Burkina Faso | 25 May 2022
- Role-playing games for improving irrigation water management. Jean-Christophe Poussin, IRD, France | 26 May 2022

(i) **Stakeholder engagement**: We used a multi-actor approach in the Innovation HUBs which involved the active participation of stakeholders: farmers, farmers' associations, water user association, cooperatives, extension services, researchers, students, meteorological services, Ministry of food and agriculture, basin water authority. This contributed to a better understanding of current conditions (baseline) and identified constraints/opportunities during the preparatory phase, and to tailor options to face them during the co-innovation phase. Thus, this co-innovation learning process led to the assessment of options that meet stakeholders' needs and are adapted to local conditions. Additional activities were organized for an on-going engagement with stakeholders, such as field sessions, while others were oriented to facilitate evidence-informed discussions such as workshops, webinars, and participation in conferences. (ii) **Capacity building**: Wagrinnova followed a mix of capacity building approaches to cover different needs and target trainers: on-site training sessions on tools and innovations mainly addressed to farmers or technicians, supervising master thesis or project works of students involved in the project, the on-the-job task-based learning and online learning sessions (webinars). All these activities contributed to the uptake of research approach, tools and co-evaluated practices. (iii) **Communication**: We developed a Plan for Knowledge sharing and research uptake identifying (1) the target audience that were likely to be interested in the project findings (researchers, practitioners, government actors, and other non-specialist audience), and (2) the type of dissemination products and actions which could be useful for disseminating and discussing research evidence (videos, press-release, workshops, FGD, farmers field sessions, papers published in peer-reviewed journals and conference presentations, among others). A key transversal element has been the project website for presenting approach, activities and main results. We also used an online internal

collaborative workspace which was very useful for sharing knowledge among partners and build collaborations

Lead partner

IAS-CSIC, Spain

Other partners

Five African Partners

- **UGB** (Université Gaston Berger), Senegal
- **ISRA** (Institut Sénégalais de Recherches Agricoles), Senegal
- **SARI** (Savannah Agricultural Research Institute), Ghana
- **UDS** (University for Development Studies), Ghana
- **INERA** (Institut de l'Environnement et de Recherches Agricoles), Burkina Faso

Four European Partners

- **IRD** (Institut de recherche pour le développement), France
- **CIRAD** (Centre de coopération internationale en recherche agronomique pour le développement), France
- **WUR** (Wageningen University & Research), The Netherlands
- **CIHEAM-Bari** (Mediterranean Agronomic Institute of Bari), Italy

Five Associate Partners

- **CILSS** (Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel), Niger
- **TRAGSA** (Grupo TRAGSA), Spain
- **HKV** (HKV Consultants Group), The Netherlands
- **AECID** (Agencia Española de Cooperación Internacional para el Desarrollo), Spain
- **TEPRO** (TEPRO Consultores Agrícolas SL), Spain

Contacts

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Email: helena.gomez@ias.csic.es

Relevant links

/

Relation to SCAR ARCH SWG PA scope

Scope and complexity: WAGRINNOVA **proposes a methodology** that leads to a sustainable intensification of smallholder water-managed agricultural systems in West Africa, through a participatory and systemic multi-scale approach (plot, farm, scheme/ watershed), taking into account the land and business environments and the opportunities for systems integration.

It **focuses on the two most common water-managed agro-ecological systems for smallholders in West Africa**: community-managed irrigation systems, and regulated or rain-fed lowlands valleys. Rice is the most common crop in both agro-ecosystems, but other diversification crops area also considered with a view to the sustainability of these systems. Participatory research is carried out by WAGRINNOVA **local Innovation Hubs**, one per agro-ecosystem and African country (Senegal, Burkina Faso, Ghana): community irrigation systems (IRRI-SN, IRRI-BF, IRRI-GH) and developed lowlands (LLV-SN, LLV-BF, LLV-GH). In addition, a hub in irrigated rice systems in Spain (IRRI-SP) has been organized to develop eco-hydrology and environmental indicators for sustainable production.

Policy relevance is embedded in research

Currently, irrigation development is particularly important in West Africa, as reflected by the High Level Forum on Irrigation (Dakar 2013), the Strategic Framework for Agriculture Water in the Sahel (CILSS 2017) and other ongoing complemented endeavours of AfricaRice, IWMI, CORAF/WECARD. In the framework of these initiatives, Wagrinnova is oriented to contribute to national and regional agendas by providing mechanisms for the sustainable intensification of the water-managed agricultural systems. Thus, **the research activities are relevant at several levels** as they contribute to almost all agricultural policies and strategies currently being implemented by the governments in the countries studied, in particular water management strategies and priority sectors for improving food and nutritional security, for example the Ghana National Irrigation Policy, Strategies and Regulatory Measures 2010. In addition, the participatory and inclusive approach with the establishment of communities of practice aim to lead to more efficient and resilient water management agro ecosystems. This is one of the major pillars of the Emerging Senegal Plan 2014, and The National Rice Development Strategy of Burkina Faso, in its phase 2 (NRDS 2) which aims to achieve self-sufficiency in rice by 2027. In Spain, Wagrinnova is relevant to improve water planning in the Guadalquivir river basin and provide arguments for the debate on Integrated Water Resources Management vs new infrastructures.

The **main stakeholders** to guarantee the valorisation of our results are the Ministry of Agriculture/Hydraulic issues or the Ministries in charge of the services for irrigated or improved lowland agriculture, through the national and regional offices (e.g. the Guadalquivir Basin Authority), and especially through the National Agricultural Research Institutions and Extension Services. Additionally, results should be shared with civil society groups (i.e. Rice Farmers Association, Association of Vegetable Growers) and NGOs with strong political lobbying capacity. Dissemination and knowledge sharing is a key element in the project, and several communication channels has been used depending on the targeted stakeholders: local workshops, short videos, field days for validating results, exchange visits, participation in conferences, research articles, etc. Policy briefs to propel irrigation and lowland agriculture development are still ongoing and are intended to be shared policymaking level.

Sinergy with other projects: in Burkina Faso, interactions with another INERA's project focused on rainfed rice provided rice varieties adapted to the Wagrinnova context. WASCAL (West African Science Service Centre on Climate Change and Adapted Land Use), provided support for the installation of hydrological equipment, and results from GENERIA project have also been capitalized. Results are relevant for DeSIRA IRRIN (INERA, CIRAD, CSIC). In Spain, activities were coordinated with MEDWATERICE (Towards a sustainable water use in Mediterranean rice-based agro-ecosystems) and ORYZONTE projects. CSIC & TEPRO are partners in MEDWATERICE,

which focuses on innovative irrigation options to reduce rice water consumption and environmental impacts. ORYZONTE aims to improve the sustainability of rice cultivation in the same area.

Overlaps and gaps of the project content compared to the other projects in the portfolio

Despite the active communication with our funding agencies, three local partners (INERA-Burkina Faso, SARI and UDS-Ghana) and the leader partner (CSIC) had delays in receiving funding which eventually affected the project implementation and monitoring. As for UDS and SARI, they only received part of the funds. This implied that SARI started collaborating only one year before the end of the project (corresponding to the one-year extension), and UDS did carry out some of the planned activities thanks to the help of another Wagrinnova partner (WUR) that advanced funds. The perpetual situation of lack of funds also implied difficulties in sustaining these activities in the frame of UDS-WUR activities. It is worth mentioning that INERA had poor access to the internet network making it difficult to keep a proactive communication with its funding agency, mainly in the online submission of accounting documents and financial reports.

It was expected a more active role of the LEAP-Agri consortium in promoting projects interactions and synergies.

Pooling knowledge from farmers, technicians, researchers and other stakeholders helped in gaining a more complete picture of the constraints and opportunities. This led to the collective identification of a large number of current and potential innovations (basket). Based on this, stakeholders co-constructed options to producers and communities. Success of the selected innovations & tools is conditional on the process being participatory (co-learning). But, this also required time and resources to re-design process, validate results and properly disseminate them. This was one of the main challenges due to the delayed in progress (covid-19, funding delay, insecure contexts). The project was perhaps too ambitious for the funding available and duration. Aspects that proved to be important in the co-construction of sustainable intensification (SI) options are the understanding of the current conditions and stakeholders needs. Gender-inclusive approach proved also to be key to taking into account roles, norms and needs of women. The knowledge co-creation spirit facilitated practical training, and a large number of dissemination actions were organized targeting main stakeholders. Additionally, the co-innovation process increased Research and Innovation collaboration between European and African partners, and generated knowledge base for developing policies (ongoing) and practices to promote SI (practitioners & other development actors) of irrigated and lowland agriculture.

Recommendation for upscaling To provide sustainability to the co-innovation process at different scales through adequate funding, training and duration while reviewing policy recommendations according to findings; Large program for training on water-pump maintenance and organization of irrigation at community level; Development of irrigation advisory services, with emphasis in targeted crops; Lowland development public program following a participative approach for scheme rehabilitation, mobilizing local labor and

promoting self-organization. Topics still to be addressed (the knowledge gaps) Further development and validation of tools to improve management and support monitoring of water resources at different scales; Opportunities and risks of "solar irrigation"; Developing new models of smallholders water users associations ; Management practices enhancing soil health and ecosystem services; Crop diversification and value chain opportunities brought in with irrigation and enhanced lowland systems.

Partnerships exploration

Some Wagrinnova local partners were involved in other LEAP-Agri projects, but with different teams. ISRA (Senegal) and IRD/INERA (Burkina Faso) participated in two other projects namely "Ramses II" (topic: agroforestry, soil sciences and remote sensing, plant and animal sciences) and "Africa-Milk" (topic: animal sciences). Both projects, together with Wagrinnova (topic: sustainable water management and sustainable food security), are under the same research and innovation focus "sustainable intensification". Although the topics were different, there could have been possible collaboration. However, it did not happen. Indeed, the situations for developing interactions have not been numerous, e.g., the LEAP-Agri mid-term meeting could have served as a platform to deepen these possible interaction options.

8. University-based Community Action Research for increasing viability of cereal-legume value chains towards improved nutrition and livelihoods in sub-Sahara Africa - **UnicARSSA**

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap-agri.com/?page_id=301

Project website: https://unicarssa.org/

Funding details

Source of funding: EUHorizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)

Type of project (+ cluster if relevant): HORIZON 2020 RIA - Research and Innovation action; LEAP-Agri cluster 2 'Agriculture and Food Systems for Nutrition projects'

Contract number: /

Project total budget (€): /

Start and end date of the project

1 September 2018 – 31 August 2022

Project summary

UniCARSSA links smallholders and rural entrepreneurs directly with universities in platforms for action to share currently available technologies, adapt them to local conditions and encourage new research for key constraints. It builds on 2 established community action research platforms (CARPS) at two universities (University of Eldoret, Kenya and Makerere University, Uganda) to address constraints in improving productivity and consumption of under-researched cereals and legumes in Kenya and Uganda to increase food and security nutrition. These crops are widely grown in the focus countries and are especially important for food security in smallholder agricultural communities.

The CARPs is instrumental in developing, adapting and scaling up innovations that improve efficient nutrient use, increase crop yields, improve post-harvest handling and develop nutritious food products that will increase demand and link the farmers in the value chains to increase the economic, environmental and social viability of these commodities. The project helps to reduce hunger and malnutrition, increase rural incomes and support commodities that contribute towards achieving the SDGs and responds to CAADP and national policy targets for stronger agricultural growth. It uses the University's outreach centres to drive community action research in accordance with the communities needs along the cereal-legume value chains. Research into increasing production, reducing post-harvest losses and increasing nutrient use efficiency in millet, sorghum, groundnuts and soybeans is carried out in collaboration with the farming communities. Using the two universities outreach centers as platforms, it strengthens the relationship with the farming communities.

OBJECTIVES:

- Improve sustainable food production while **reducing soil degradation**, as well as improving Food and Nutritional Systems (FNS) at the household and community level
- Increase resilience of farming systems and food production through the rehabilitation of degraded soils and the diversification of cereal-legume cropping systems
- Development of ready-to-use supplementary foods (RUSFs) from locally available highly nutritious cereal and legume crops
- Strengthening of local nutrition-sensitive value chains through research and capacity building of rural entrepreneurs
- Capacity building of local innovation systems through a multi-stakeholder approach (CARPs), and involvement of MSc and PhD students

Project results

UnicARSSA contributes to **sustainable food security** through the aspects of crop diversification and the inclusion of resilient crops such as sorghum, millet and grain legumes in to the farming systems. Such crops can cushion farmers against adverse effects of climate change while providing their daily food and income needs. UniCARSSA covers the whole **value chain** from production where high quality manures and micronutrients are applied to degraded soils for their rehabilitation to a good mix of both high value cereals and grain legumes for family and community **nutrition**. For those crops, their nutritional value is later improved through the development of the RUSFs. The geographic area of **food systems governance and farmer organisations** was addressed by including the CARPs which are umbrella organisations of various farmer groups and hence greater impact.

Research Outputs

(1) Value chains for sorghum, millet, groundnuts and soybeans established

(2) Agronomic package that includes Zn, variety and management for use on poor responsive soils developed

(3) An artificial intelligentbased approach to deter birds from infesting cereals in crop fields developed

(4) Development of a premix for brown Ugali made from sorghum flour designed to meet the nutrient requirements of young children

(5) Awareness-raising on nutritious diets and RUSFs in local communities

(6) Capacity strengthening of FAs in entrepreneurship and innovation.

Research Outcomes

- Uptake of soil-enhancing technologies,
- Diversified and resilient cereal-legume cropping systems,
- Rural entrepreneurs linked into local markets for nutritious RUSFs,
- Strengthened capacity of local value chains for nutritious food products,
- More effective CARPs for joint innovation and transdisciplinary research

Peer-review publications: (scientific)-10; Non-peer review publications (e.g. Technical, educational, etc.)-1; Scientific & Innovation products (patents & others)-4; Dissemination actions: workshops, training sessions, etc. (local/national/international)-13; Career development: jobs created (permanent/ temporary)-14.

Results summary

UniCARSSA was conceived on the premise that continuous engagement of universities with the community would contribute to (i) increasing their agricultural productivity and thus improved livelihoods (ii) diversifying their cropping systems and thus lead to improved nutrition and also increase the resilience of the agro systems to the effects of climate change and (iii) capacity building of communities and creation of stable linkages between the community and relevant stakeholders. Strengthening of these value chains was key. As an entry point, UniCARSSA used an already established CARP Platform (UoE, BUSSFFO, SMEs e.g EASTCOM Foods, County Governments, Input Suppliers such as MEA, ICRISAT) for participatory action and academic research. Within the project, transdisciplinary research was focused on improved productivity, soil nutrient-use efficiency, enhanced value chain operations, reduced post-harvest losses and improved nutritional contribution of cereals and legumes in smallholder agriculture for improved livelihoods, rural incomes and FNS, whilst strengthening capacities and improving the relevance and contribution of universities to achieving SDGs and CAADP goals. Most activities under UniCARSSA were completed with the exception of a few which includes participating in the LEAP Agri funded Projects initiatives final meetings in Kenya and Uganda, continuation of dissemination which includes the participation of UoE and MAK organized conferences and completion of work by students and their graduation.

Food Security, Food Safety, Nutrition & Poverty Reduction

The CARP model adopted by UniCARSSA provides a platform where stakeholders in the different value chains converge for the benefit of increasing productivity and ensuring the efficiency of the value chains. UniCARSSA has supported farmers and value chain actors in cereals and legumes to access appropriate technologies, specifically, access to information, access to markets of the four study crops (sorghum, millet, soybeans and groundnuts), linkages of farmers to relevant stakeholders e.g markets, microfinance, access to ICT for agriculture, i.e. the designed artificial intelligent-based approach to deter birds from infesting cereals in cereal crop fields. Further appropriate technologies e.g. an agronomic package that includes Zn, crop variety and management for use on poor responsive soils was established and disseminated. The project built the capacity of farmers in in making of biochar from locally available organic

materials and application of biochar with small doses of inorganic fertilizers to improve soil fertility and control of striga using cereal-legume cropping systems. An attempt to include both women and men in all stages was made.

Nutrition

Firstly, inclusion of Zn in the fertilisation regimes was the entry point with results indicating that application of Zn at both 1.5 and 3 kg ha-1 improved its uptake and raised the content in the harvestable grains. This Zn was later traced in the food products that were developed confirming an improved quality of the crops grown on soils fertilised with Zn. To enhance utilisation of the four test crops within the community, a total of six products from sorghum, millet, soybean and groundnuts and maize were developed. Five of the products were developed based on the four crops (sorghum, millet, soybeans and groundnuts) under study, whereas the sixth product is a nutrient dense and sensory enhanced sorghum (Sorghum bicolor (L.) Moench) based stiff porridge (Ugali) for young children. For these products, chemical analysis including protein, tanins, phenols and Phytic acid contents, as well of digestibility in vitro was done.

Results from the project showed that Inclusion of the micronutrient Zn in fertilizer regimes and use of biochar led to increased yields and improved quality thereby contributing to food and nutrition security. Inclusion of sorghum, millet, soybeans and groundnuts in cropping systems not only provides diversity for the communities in terms of food and nutrition but also spreads the risk in situations of long spells of drought and floods thereby increasing the resilience of the communities to effects of climate change.

The project has promoted production and consumption of cereals and legumes to provide diversified diets to households. In UniCARSSA, six food products were developed one of which was analysed to determine the quality in terms of nutrition requirements for young children. These products whose main ingredients are sorghum, millet, soybeans, groundnuts and indigenous vegetables are aimed at enhance the diversification of diets at household levels. Further, the development of nutrient dense stiff porridge that has Zn and vegetables contributes to the improvement of the immune system and helps the body fight against infectious diseases such as COVID-19. Consumption of such nutritious foods reduces the problem of stunting and wastage in young children and also contributes to the dietary nutrient requirements of adolescents.

Value chain mapping and analysis

Results indicated that for the four crops, utilisation, marketing and gender dynamics played a role in the effectiveness/efficiency of the value chain. Development of an artificial intelligent-based approach to deter birds from infesting cereals in cereal crop fields reduced losses and contributed to improved yields. The project targeted incorporation of all the four strands of research uptake, stakeholder engagement, capacity building, communication, monitoring and evaluation. Firstly, a joint identification of gaps and challenges to be addressed by the project was done. Secondly, all members participated in the data collection in both UoE and MAK; these including surveys, focus group discussions and field experiments and demonstrations. Thirdly, the selection for the sites for the field experiments and demonstrations also involved both the UniCARSSA members and the farmers thus fostering learning and co-creation. For the field experiments, a joint field day between UOE UniCARSSA members and sub county of Bumula in Bungoma County was organized bringing together different stakeholders. Further, farmers representing different groups in the community attended the 2022 UoE Annual Agribusiness

Trade Fair which was attend by over 7000 famers and stakeholders. Farmers got to showcase their products as well as interact with various stakeholders in the agricultural sector. Finally, the capacity building activities emphasizes gender mainstreaming in research activities, interdisciplinary research and a multi-stakeholder approach.

Economic aspects

A detailed household economy analysis was undertaken to estimate the contribution of cereals and legumes to household food and nutrition security and incomes. Thresholds of household resilience to climate shocks such as drought and floods were estimated. Findings were disseminated to policy makers and various to inform interventions and programs in project communities. Furthermore, using this information, capacity of households were built to increase yields of the main cereals and legumes. In UnCARSSA, the management of degraded soils by application of micronutrients specifically Zn and application of organic materials together with the use of biochar improves soil fertility and reduces degradation. Further, crop diversification to include climate smart crops such as sorghum, millet and legumes for agricultural productivity increases the household and community incomes as well as improving the resilience of farms to effects of climate change. Crop diversification reduces the overdependence on one crop such as maize and as such spreads the risk of the farmer having to lose all of his crops due to either prolonged drought or incidences of floods.

The project has promoted increased production of cereals and legumes which constitute the main diet of the project communities. Yields of millet, sorghum, soybeans and groundnuts ranged between 1.5 to 2.5 tonnes which is much higher than what is usually produced. In addition to increased production, the project supported communities and other value chain actors in postharvest handling and value addition in part to increase shelf-life and availability of nutritious food. Farmers were also trained on food safety during preparation and storage. For groundnut production, awareness was created o the issue of postharvest handling so as to minimize the level of aflatoxins which are associated with this crop.

The use of crop rotation including edible legumes can benefit soil productivity, promoting higher yields and increase direct markets but also markets with value added as the food processing. In UniCARSSA, agricultural productivity was increased though improved yields. Promising technologies were tested on farmer managed demonstrations. An intensive capacity building programme was executed to farmers, their associations and other value chain actors on a range of topics including postharvest handling, value addition and marketing and agribusiness The project supported local communities to produce more through integrated soil and water management and climate smart agronomic practices for cereals and legumes. Through digital skills training, the project enhanced farmers' access to knowledge, market intelligence and other associated digital services. Farmers were trained on how to produce for the market and then linked to these markets. Capacity building for the small and medium local entrepreneurs was done so as to increase their scope in terms of utilisation of the local crops for their industries.

Community engagement

UniCARSSA links smallholders and rural entrepreneurs directly with universities in platforms for action to share currently available technologies, adapt them to local conditions and encourage new research for key constraints. It will build on 2 established **community action research platforms (CARPS)** at two universities (University of Eldoret, Kenya and Makerere University, Uganda) to address constraints in improving productivity and consumption of under-researched

cereals and legumes in Kenya and Uganda to increase food and security nutrition. These crops are widely grown in the focus countries and are especially important for food security in smallholder agricultural communities. The CARPs are instrumental in developing, adapting and scaling up innovations that improve efficient nutrient use, increase crop yields, improve post-harvest handling and develop nutritious food products that will increase demand and link the farmers in the value chains to increase the economic, environmental and social viability of these commodities. The project helps to reduce hunger and malnutrition, increase rural incomes and support commodities that contribute towards achieving the SDGs and responds to CAADP and national policy targets for stronger agricultural growth. The project uses the University's outreach centres to drive community action research in accordance with the communities needs along the cereal-legume value chains. Research into increasing production, reducing post-harvest losses and increasing nutrient use efficiency in millet, sorghum, groundnuts and soybeans is carried out in collaboration with the farming communities. Using the two universities outreach centres as platforms strengthens the relationship with the farming communities.

Earlier research revealed that soils in Western Kenya were deficient of the micronutrient zinc. This micro-nutrient is also lacking in people's diets. It is one of the deficiencies contributing to malnutrition and stunting in young children. During field demos conducted with 32 farmer groups in Bungoma and Siaya, it is shown to the farmers how to apply zinc as an additional fertilizer in fields where they planted sorghum. The results exceeded expectations. Not only did the farmers' yields increase, but lab tests also showed that zinc applied to the soil was taken up and retained in the harvested sorghum. It was even still available after preparing ugali from sorghum flour.

The University of Eldoret has a helpful vehicle for scaling technologies and innovations: the Community Action Research Platform. It brings together researchers and farmers with stakeholders along the value chain, such as input suppliers, wholesalers, market off-takers, agricultural insurance companies, and importantly, county governments. The Platform to learn from farmers about their constraints and innovation needs, as well as for capacity building, boosted the research uptake. For instance, the over 500 smallholders trained in the project produce more, and some farmer groups started supplying cereals and legumes to small and medium-sized companies such as EASTCOM Foods. This company, which was a partner in the project, lacked a steady supply of raw materials for value added products made from sorghum and millet.

The project thus contributed to **establishing new value chains** for the research crops, which can eventually also benefit farmers outside the research area. One farmer group, empowered by the four-year capacity training, pulled resources to buy their own milling equipment. They now produce sorghum and millet flours, thus adding value to their crops while reducing post-harvest losses.

Consumers acceptance of products made from these new flours showed that given its high nutritional value, this flour would be perfect for ugali served in schools and hospitals. It was tested among primary school children and their parents. In terms of colour, the children preferred the white, maize-based ugali over the brown-coloured ugali made from sorghum flour. They called it 'dirty ugali'. A blind sample test focusing on taste, however, yielded more positive responses.

The Outreach Centre at the University continues to organise **trainings and agricultural shows**, which elicit a lot of interest for project **nutritious brown ugali**. Efforts were made to secure

funding to have the brown ugali certified, so it can be commercialised and scaled. The porject findings clearly show its potential for achieving more healthy diets as well as income security for Kenyan smallholders.

The project through the PhD student has developed an Artificial intelligence based tool to detect and scare away birds in the cereal crop fields, hence reducing postharvest losses. Furthermore, the project has developed an artificial intelligence tool for mining and integrating farmer tacit knowledge into the extension systems. The project has trained 10 graduate students and 10 undergraduate students in Agriculture, specifically, Agronomy, Soil Science, Food Science, Community Nutrition, Agricultural Economics and Rural Development and ICT for Agriculture.

The objectives of UniCARSSA are aligned with the priorities of the National Development Plans in Kenya and Uganda. For Kenya, food security and improved nutrition for all citizens is one of the big four initiatives of its Medium-Term Plans (2018-2022). The focus will be increasing food production and supply, reduce food prices and support value addition in food processing. UniCARSSA outcomes will contribute to this. For Uganda, the first objective of its NDP II (2016-2020) and the successor NDP III have focused on increased sustainable production, productivity and value addition, recognizing that agriculture is the main sector that contributes to Uganda's economic growth and poverty reduction. To increase agricultural productivity, the government focuses on, amongst others, promoting sustainable land use and soil management, agro-processing, and integration of ICT's which is also being addressed by UniCARSSA. Ugandan's NDP III chapter 14 on digital transformation identified ICT as one of the core pillars social-economic transformation The international development priorities of Portugal and the Netherlands also include food and nutrition security.

Policy relevance

UniCARSSA addresses the following policy themes - food and nutrition security by developing nutritious foods (both at community level and by supporting agro-processing of nutritious foods) - improve resilience and productivity of agricultural systems in the face of soil degradation and climate change - ICT innovation and integration into agriculture sector to enhance sector efficiency and effectiveness, digital skilling.

Communication to policy makers executed through

(1) discussions in forums where the policy makers are represented,

(2) policy briefs and position papers,

(3) webinars and workshops,

(4) project website and social media platforms.

The results are geared towards improving resilience of agricultural systems at local, national and regional level. Therefore, policy makers in the agricultural and ICT sectors at both local and national levels are the key recipients of our findings. It is worth noting that results of our studies are equally relevant at regional and international levels. However, the RUSFs products developed from the UniCARSSA would find relevance for both national and international trade policymakers and for further strengthening of the SME's and Cottage industries. Given the multidisciplinary and multistakeholder approach to project implementation, the lessons learned are critical for collaborating institutions in designing successful joint projects. The lessons from knowledge co-creation approaches to project implementation, i.e., the type of training that involves interactions

with the various stakeholder through the CARPS model would also benefit policy makers in Academia and industry (private sector).

The project **developed interactions with other non-LEAP-Agri projects**. In Kenya at UOE for instance, UniCARSSA collaborates with two Belgian VLIR-UOS Cooperation funded projects titled (1) Research based education for sustainable rural development' where training for MSc students emphasizes on practical skills training in a multicultural and multidisciplinary environment and (2) Adapting to climate-resilient farming systems in Western Kenya: the sustainable path by embedding agroecology in research, education and outreach (ADCLIM). Further UniCARSSA builds on another completed project 'CONNESSA' that worked on the rehabilitating of degraded soils in East and West Africa using local materials funded by the ERA-NET ERAFRICA model. All these interactions help in building a body of knowledge on improving the resilience of agricultural systems. In Uganda UniCARSSA project has built partnership with the **National Agriculture Research Organization focus on legume** (The national groundnut programme) and also the national RICE development programme in the design and implementation of the project. Built partnership Uganda National Farmers Federation (UNFFE) who are implementing a national project on ICT4farmers, to help with farmer mobilization and awareness.

Collaboration with the LEAP-Agri consortium encourages African countries to set aside money for research work to solve problems that are contextual which is difficult based on the many pressing needs of their governments. It also encourages research by African institutions thereby increasing their visibility on the global front of academia as well as encouraging resources towards the strengthening of capacity in these institutions. For the European institutions, the LEAP-Agri consortium collaboration builds more networks for their institutions as well promoting cosupervision of students.

Awareness raising to nutrition, capacity building and community engagement

A huge gap in terms of the nutrition awareness and production of nutritious products from the four test crops was identified within the communities. In consultation with the community, training modules in this area were developed and training carried out. Training sessions were intense and emphasized on the importance of a healthy community free from disease and pandemics such as COVID-19 and HIV/AIDS using locally produced foods targeting the four test crops. UniCARSSA set out to strengthen local nutrition-sensitive value chains through research and capacity building of rural entrepreneurs (individuals and SMEs). The intervention was more towards sensitisation including honest dialogues, demonstrations, capacity building for farmers through their groups, Farmer Associations and linking of the farmers to relevant Stakeholders. Campaigns of behaviour change were included in the capacity building activities where food preparation including alternative crops was taught. UniCARSSA identified gaps in quality of produce required by markets such EASTCOM, Kenya Breweries and the local market and trained farmers on how to achieve the required quality for the market. Finally, UniCARSSA stresses the importance of continuous engagement with the community by providing a platform through which problems can be identified and solved in-situ. The university CARPs provide this platform. UniCARSSA has in its project life trained ten postgraduate students; three in UoE, one in WUR and six in MAK and indirectly supported several undergraduate students.

The project built capacity of farmers and value chain actors majority of who were women and youth. Farmers were trained on topics identified during a training needs gap analysis at the

beginning of the project and included (1) Sustainable Soil Management including Soil Testing and Fertilizer Use, (2) Climate smart agronomic Practices for sorghum, millet, soybeans and groundnuts, (3) Group dynamics (4) Post-harvest Handling Management and Waste Reduction, (4) Value Addition and Product Innovation (5) Agribusiness, Marketing and Entrepreneurship (6) Financial Literacy and (7) Digital literacy skills. Further, farmer-managed demonstration plots were established and the training on good agronomic practices centred around this. The demonstrations also served to scale the results from the field trials established at the beginning of the experiment. The training topics were identified as those that would help them improve their production of the four test crops and were selected based on the challenges identified along the value chain. An attempt to integrate gender into the training sessions was made and convenient time, venue and context for the training sessions were considered for both male and female participants.

Lead partner

University of Eldoret, Kenya

Other partners

- Royal Tropical Institute / Koninklijk Instituut voor de Tropen (KIT), Netherlands
- Makerere University, Uganda
- Universidade de Lisboa, Portugal

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Relevant links

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Relation to SCAR ARCH SWG PA scope

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Overlaps and gaps of the project content compared to the other projects in the portfolio

In Uganda, there were structural challenges in National Council of Science and Technology to Ministry of Science Innovation and Technologies and now to the Office of the President. The changes affected the access to resources and overall guidance. However, the current secretariate at the Office of the President is supportive, hence the tremendous results we have seen in 2022.

9. Capacity Development for Agricultural Innovation Systems - CDAIS

PROJECT INFORMATION

Source(s)

FAO website: https://www.fao.org/research-extension-systems/projects/cdais/en/
Project website: https://cdais.net/home/

Funding details

Source of funding: Funded by the European Union, jointly developed and implemented by Agrinatura and FAO

Type of project (+ cluster if relevant): EU-FAO Partnership programme

Contract number: GCP/GLO/626/EC

Project total budget (€): € 13 356 851

Start and end date of the project

1 January 2015 – 31 August 2019

Project summary

In 2012, as part of a G20 initiative, the Tropical Agriculture Platform (TAP) was established to improve the global coherence of capacity development for agricultural innovation. Innovation plays a key role in spurring the transformation of the agriculture sector to meet and enhance food security and nutrition, resilience and livelihoods of millions of family farmers. However, in low-income and lower-middle income countries, the capacities to harness the potential of innovation are very limited, owing to, among other things, poor and underperforming agricultural innovation systems (AIS). CDAIS project was then launched in January 2015 to support TAP. CDAIS joined Agrinatura and FAO partnered with funding from EU to strengthen capacities in Angola, Bangladesh, Burkina Faso, Ethiopia, Guatemala, Honduras, Lao People's Democratic Republic and Rwanda. The expected outcome was "agricultural innovation systems are efficient and sustainable in meeting demands of farmers, agribusiness and consumers". Its specific objective was to establish "a global partnership on capacity development in agricultural innovation systems on a sustainable footing, with needs assessed and approaches validated in eight pilot countries".

Project results

- ✓ The project developed **a vision for capacity development in agricultural innovation systems**, based on **needs identified by stakeholders in each of the eight pilot countries**.
- ✓ It is used as a basis to develop **tailored interventions**, and for CDAIS **to support informed policy formulation and future investments** that can then be scaled out.
- ✓ The project **provided capacity needs assessment, facilitation and policy dialogues at the three Common Framework levels (niche, organizational, national/enabling environment**). This dynamic in turn leads to increased appreciation of the Common Framework, in particular the building of functional capacities, and increased use of the Common Framework approach to capacity development. Both of these outcomes lead to the intermediate outcome of improved system capacity.
- ✓ CDAIS was relevant to European Commission's Directorate-General for International Cooperation and Development, and this is proven by the granting of **USD 5 million to continue supporting TAP for five more years** through the Development Smart Innovation through Research in Agriculture (DeSIRA) programme.

On a national level

- ✓ CDAIS used continuous learning cycles to enhance functional innovation capabilities in Africa, Asia and Central America. In eight pilot countries, CDAIS joined partners and key players to address often identified challenges and opportunities in specific regions or value chains. Together, international, national and local partners developed and implemented capacity development plans for agricultural innovation.

At the World level

- ✓ CDAIS supported the Tropical Agriculture Platform (TAP) whose mission is to capitalize and consolidate knowledge of agricultural innovations around the world. A general analytical framework was designed to help, evaluate and improve the innovation capabilities of individuals or organizations. It was nourished by continuous feedback from lessons learned from national and local actions.

Lead partner

AGRINATURA (The European Alliance for Agricultural Knowledge for Development) and FAO

Other partners

- CIRAD (France) is responsible for the implementation of the CDAIS project in Laos (UMR Green) and in Burkina-Faso (UMR Innovation).
- ISA/UL (Portugal) L'Instituto Superior de Agronomie/Universidad de Lisbon is responsible for the implementation of the CDAIS project in Angola.
- ICRA (Netherlands) is responsible for the implementation of the CDAIS project in Ethiopia and in Guatemala (since 2017).
- AICS (Italy) La Agenzia Italiana per la Cooperazione allo Sviluppo – Italian Agency for Development Cooperation is responsible for the implementation of the CDAIS project in Guatemala (until 2017) and in Honduras.

- NRI (Great Britain) National Resources Institute is responsible for the implementation of the project in Bangladesh and in Rwanda.

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Relevant links

https://cdais.net/indicio/. This is the official website of the project.
https://www.fao.org/research-extension-systems/projects/cdais/en/. This is the FAO presentation of the project.
https://agrinatura-eu.eu/. This is the link to the webpage of The European Alliance on Agricultural knowledge for Development.
https://www.fao.org/in-action/tropical-agriculture-platform/en/. This is the TAP webpage.
https://www.fao.org/in-action/tropical-agriculture-platform/projects/cdais/en/. This is the TAP webpage with information to CDAIS project.
https://tapipedia.org/content/capacity-development-agricultural-innovation-systems-cdais-project-global-partnership. This is the TAP webpage to summarize main features and goals of CDAIS project.
https://tapipedia.org/sites/default/files/cdais-brochure-10-2015.pdf. This is a general brochure presenting the CDAIS project.
https://openknowledge.fao.org/server/api/core/bitstreams/344096bd-314c-4afe-afa8-86c9f4a9df8f/content. This is a link to the evaluation report of the CDAIS project.
https://cdais.net/publications/guidesmanuals/. This is the link containing of the publications, guides and manuals of the project.
https://cdais.net/wp-content/uploads/2019/08/CDAIS-M1-CNA-Capacity-Needs-Assessments.pdf. This is a manual produced as a resource to train National Innovation Facilitators across all eight pilot countries to carry out capacity needs assessments in agricultural innovation niche partnerships.
https://cdais.net/wp-content/uploads/2019/08/CDAIS-M2-ORG-Organisational-Strengthening.pdf. This guide was developed to support facilitators responsible for building the capacity of organisations that provide innovation support services in the food and agriculture sector.
https://cdais.net/wp-content/uploads/2019/08/CDAIS-M3-INP-Innovation-Niche-Partnerships.pdf. This is the guide to the coaching process.
https://cdais.net/wp-content/uploads/2019/08/CDAIS-M4-MP-Organising-a-Marketplace.pdf. This is a practical guide to using the TAP Common Framework in order to organise a Marketplace.
https://cdais.net/wp-content/uploads/2019/08/CDAIS-M5-PD-Organising-a-Policy-Dialogue.pdf. This is a practical guide to using the TAP Common Framework in order to organise a Policy Dialogue.

https://cdais.net/wp-content/uploads/2019/08/CDAIS-M6-MEL-Monitoring-Evaluation-and-Learning.pdf. This document presents the framework into which the monitoring, evaluation and learning component of the CDAIS project was conceived, the objectives it pursued, and how it was implemented.

Relation to SCAR ARCH SWG PA scope

- ✓ Perfectly matches with innovating approaches in agri-food systems and the cooperation with the south. It is a partnership that involves a cluster of projects in different countries over three continent and therefore, it will be complex to evaluate in terms of impacts.
- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building", international dimension and funded by an EU funding authority.
- ✓ Focus on the transformation of agri-food systems (from primary production to diets).
- ✓ Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical with a special attention to the strategic partnerships of the EU (Africa, Mediterranean, Latin America) and the low and middle income countries.
- ✓ To make an impact, the CDAIS partnership mobilized political support at global, regional and country level through the Food and Agriculture Organization of the United Nations (FAO) and the Tropical Agriculture Platform (TAP)
    - receive technical support from AGRINATURA members and FAO,
    - respond to demands from governments, and to the needs of stakeholders.

Overlaps and gaps of the project content compared to the other projects in the portfolio

Let's check the full list of projects to fill out this part. Some gaps could be specifically covered in ABEE.

10. West African Breeding networks and Extension Empowerment - ABEE

PROJECT INFORMATION

Source(s)

Capacity4dev DESIRA website:
https://capacity4dev.europa.eu/projects/desira/info/abee_en
CORAF website: https://www.coraf.org/projects/content/Oyuw-flyers-abee-en.pdf

Funding details

Source of funding: European Union: DG-INTPA-DeSIRA Partnership for Innovation

Type of project (+ cluster if relevant): DeSIRA Partnership for Innovation

Contract number: 192-ABEE

Project total budget (€): € 8 771 930

Start and end date of the project

1 October 2019 – 30 September 2024

Project summary

The West African agricultural sector represents around 35% of the region's gross domestic product and employs 60% of the active population. However, several factors are hampering growth in agricultural productivity, including the fact that quality, reliable and affordable seeds and fertilizers are difficult to access and that the link between research, farmers and markets is still weak. In addition, there is still little information on new agricultural technologies and best farming practices. The region has some of the lowest yields per hectare in the world. In addition, West Africa is already experiencing rising temperatures, rainfall that varies from year to year and increasingly frequent and devastating extreme weather events.

Then, the ABEE Project aims to strengthen the resilience of rural communities in the Sahel to climate change through the establishment of modern equipment and infrastructure for the breeding of varieties of five climate-sensitive crops. It seeks to reach over 40,000 direct beneficiaries in five years (2020-24). It boosted agricultural productivity and smallholder farmers' resilience in the face of population growth, economic vulnerability and climate change. More specifically, the project implemented a better coordinated approach to varietal selection, both at regional and national level, by placing breeders of the five target crops (millet, sorghum, fonio, peanuts and cowpeas) from three countries **(Burkina Faso,**

Niger and Senegal). It met the needs of farmers in West Africa through strengthening of networks and institutional capacities in Plant breeding for the development of resilient crops.

Project results

- ✓ Small producers are willing to access, adopt and use new, more efficient varieties, which meet local needs and market demand. 18.224 tonnes of pre-basic seeds produced at from new varieties or already demonstrated, 178 tests conducted, 238accessions shared as part of the regional exchange network of varietal material.
- ✓ Breeding programs in the three partner countries are strengthened to develop and promote improved and resilient varieties in an efficient manner.
- ✓ Breeding programs efficiently exchange genetic material and data at regional level in a network coordinated by the National Centers of Specialization and the Regional Centers of Excellence.
- ✓ The Regional Center for the Improvement of Adaptation to Drought in the Sahel (CERAAS), with the support of CIRAD and the Africa Rice / Integrated Breeding Platform, serve as a virtuous loop for fulfill these results.
- ✓ Creation of a new generation of breeders and researchers, active in the modernization of varietal improvement. This will have a major impact on the capacity of selection programs to implement best practices thanks to the involvement of newly trained scientists.
- ✓ Educational results:
    - 917 Demonstration tests carried out in farming environments: 3.621 producers contacted in collaboration with partner Producer Organisations in Burkina Faso, Senegal and Niger, 40% of them women, and 1.663 people reached, 35% women & 65% men.
    - 12 PhD students including 2 women, 40 Master II students including 7 femmes, recruited and supervised.
    - Surveys in rural areas, with various players in the value chains, to understand constraints, analyse demand and translate it into variety profiles.
    - Organisation of workshops at national level to define the profiles of improvement products and translate them into selection targets. 43 Participants 4 Countries.

Lead partner

West and Central African Council for Agricultural Research and Development (CORAF/WECARD)

Other partners

✓ Centre de Coopération Internationale en recherche agronomique pour le Développement (CIRAD), France

✓ AfricaRice / Integrated Breeding Platform (AR/IBP)

✓ Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso

✓ Institut National de la Recherche Agronomique du Niger (INRAN)

✓ Institut Sénégalais de Recherches Agricoles / Centre d'Étude Régional pour l'Amélioration de l'Adaptation à la Sécheresse (ISRA/CERAAS)

Other stakeholders: The following producer organizations: YIYE Plateforme, Minim Song Panga and Sougr Nooma (Burkina Faso); Mooriben and Fuma Gaskiya (Niger) and ASPRODEB and RESOPP (Senegal).

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Relevant links

https://capacity4dev.europa.eu/projects/desira/info/abee_en. Project website.
https://www.coraf.org/resources/content/2ru6-abee-flyer.pdf. Coraf presentation of the project.
https://www.coraf.org/projects/content/fGIs-brochure-abee-fr.pdf. Coraf brouchure of the project.
https://www.cirad.fr/en/cirad-news/news/2020/science/west-africa-abee-project. Cirad presentation of the project.
https://www.cirad.fr/en/worldwide/platforms-in-partnership. CIRAD geographical partnership strategy, centering on the implementation of platforms in partnership for research and training.
https://www.integratedbreeding.net/1865/about-abee. Integrated Breeding Platform website-
https://leap-agri.com/ Website of the ERA-Net cofund LEAP-Agri is a joint Europe and Africa Research and Innovation (R&I) initiative on Food and Nutrition Security and Sustainable Agriculture (FNSSA) launched in the frame of H2020 European program that implemented the priority one of the AU-UE Hight Level Policy Dialogue on Science, Technology, and Innovation.
http://gldc.cgiar.org/west-africa-producers-will-benefit-from-a-new-european-plant-breeding-project/ The goals and output indicators.

Relation to SCAR ARCH SWG PA scope

- ✓ Interesting project aiming at transforming crop production to face the growing demand in a context of climate change. Important to look at the outcome of the PhD students engaged in the project. This project should be co-evaluated with the NUTRIFOODS LEAP AGRI.
- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building" with an international dimension, funded by an EU funding authority.
- ✓ Focus on the transformation of agrifood systems (from primary production to diets).

- ✓ Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical with a special attention to the strategic partnerships of the EU (Africa, Mediterranean, Latin America) and the low and middle income countries.

Overlaps and gaps of the project content compared to the other projects in the portfolio

- ✓ Interesting project aiming at transforming crop production to face the growing demand in a context of climate change. Important to look at the outcome of the PhD students engaged in the project. This project should be co-evaluated with the NUTRIFOODS LEAP AGRI.

11. Promote ecological intensification and inclusive value chains for sustainable African milk sourcing -AFRICA MILK

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap-agri.com/?page_id=285
Project website: https://www.africa-milk.org/about-the-project

Funding details

Source of funding: EU Horizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)
Type of project (+ cluster if relevant): LEAP Agri Cluster 1 'Sustainable Intensification projects'
Contract number: LEAP-Agri GA No 727715; and Fondation Internationale pour la Science GA No. I1-B-6534-1
Project total budget (€): €1.549.100

Start and end date of the project

1 January 2018 to 31 December 2021

Project summary

Today in Africa, demand for dairy products is rising. However, dairies have difficulties to source local milk in terms of volume, regularity and quality. Sustainability of dairy production, contribution of dairy to food security, and inclusion of producers in value chains (i.e. women and youth) are becoming major stakes. Africa-Milk supports co-design and implementation of technical, organizational and institutional innovations to increase and secure local milk sourcing, considering the potential of ecological intensification of milk production and the development of inclusive milksheds.

The overall consortium includes African research organizations (ISRA, INERA, UoN, FIFAMANOR), WUR and CIRAD in Europe, all with strong experience on African milk production and sustainable development, and nine processors in four countries (Senegal, Burkina Faso, Kenya, Madagascar), covering a variety of agro-climatic and production contexts. It is a participatory research project, with multiple objectives: social (job creation, food security, better quality food), economic (increased incomes for dairy farmers and a more dynamic supply chain), and environmental (more ecological production and collection systems).

Project results

- ✓ Stakeholders have increased innovation capacity; stakeholders have implemented efficient and inclusive milk collection systems; and producers have implemented intensive and ecological dairy farming systems.
- ✓ Baseline studies. Africa-milk's research began with a baseline study of milk production at dairy farms level and a baseline study of milk collection systems. These baseline studies, have been carried out in each case studies selected by the project, in order to understand how milk is produced and how it is collected.
- ✓ Innovations at milkshed level. Co-design and implementation of efficient and inclusive milk collection systems through organizational innovations (optimized collection routes, functional collection centers, use of cooling systems), and institutional innovations (contractual arrangements between dairies and producers through milk delivery contracts, including seasonality-based and/or quality-based milk payments)
- ✓ Innovations at farm level. Co-design and implementation of intensive and ecological dairy farming systems based on improvement of cow feeding systems using local resources, and simple practices to improve milk hygiene (technical innovations)
- ✓ Monitoring, Evaluation and Learning

Lead partner

Centre de Cooperation International en Recherché Agronomique pour le Development (CIRAD), Two Cirad's mix research units "Selmet" and "Innovation", France

Other partners

- University of Nairobi, , Kenya
- Wageningen University & Research (WUR), The Netherlands
- Institut Sénégalais de Recherches Agricoles (ISRA), Sénégal
- Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso
- Fiompiana Fambolena Malagasy Norveziana - Centre de Développement Rural et de Recherche Appliquée (FIFAMANOR), Madagascar

Contacts

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Relevant links

https://leap-agri.com/?page_id=285. Leap-agri website of the project.
https://www.africa-milk.org/about-the-project Official website of the project.
https://leap-agri.com/?news=4-leap-agri-projects-chosen-as-the-most-promising-projects-for-the-highest-business-potential

https://www.youtube.com/playlist?list=PLB_m1-kakr3p0JPh0APD-85Vz9IW_u0sz Youtube channel of the project.
https://leap-agri.com/wp-content/uploads/2021/11/Early-effects-of-the-COVID-19-outbreak-on-the-African-dairy-industry.pdf. This paper provides an early assessment of the effects of the COVID-19 outbreak and of subsequent response measures on milk production, collection, processing, marketing and consumption in Africa.
https://leap-agri.com/wp-content/uploads/2021/11/Dairy-farming-systems-driven-by-the-market-and-low-cost.pdf. Study of the dairy farming systems driven by the market and low-cost intensification in West Africa: the case of Burkina Faso
https://leap-agri.com/wp-content/uploads/2021/11/Characterization-of-dairy-innovations-in-selected-milksheds-in-Kenya.pdf Study of the Characterization of dairy innovations in selected milksheds in Kenya

Relation to SCAR ARCH SWG PA scope

- ✓ This project claims for innovation capacity at the level of stakeholders in the milk value chain. Interesting to see the real impacts of such a project.
- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building" with an international dimension, funded by an EU funding authority.
- ✓ Focus on the transformation of agrifood systems (from primary production to diets)
- ✓ Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical with a special attention to the strategic partnerships of the EU (Africa, Mediterranean, Latin America) and the low and middle income countries.

Overlaps and gaps of the project content compared to the other projects in the portfolio

Let's check the full list of projects to fill out this part. Some gaps could be specifically covered in projects with a nutritional scope.

Important here the business development impact.

12. Adapted Agroforestry Systems for the Central American Dry Corridor - AGRO-INNOVA

PROJECT INFORMATION

Source(s)

Capacity4dev DESIRA website: https://capacity4dev.europa.eu/info/agroinnova_en
Project website: https://agroinnova.iica.int/

Funding details

Source of funding: funded by EU DG-INTPA-DeSIRA Partnership for Innovation and implemented by IICA (Inter-American Institute for Cooperation on Agriculture)

Type of project (+ cluster if relevant): DeSIRA

Contract number:/

Project total budget (€): € 6 600 000

Start and end date of the project

1 November 2019 – 30 April 2024

Project summary

The AGRO-INNOVA project is implemented by the Inter-American Institute for Cooperation on Agriculture (IICA), with financial assistance from the European Union (EU), in association with 21 public and private national partners, in six Central American countries: Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama, as well as with the technical and research support of the Tropical Agricultural Research and Higher Education Center (CATIE).

The project aims to improve the situation and resilience of small producers of the Central American Dry Corridor, through the validation and extension of innovative agricultural technologies and practices with multistrata agroforestry system for the production of basic staple foods, as maize and beans. The project seeks through its general objective through two routes of action. The first seeks to promote the adoption of technologies in agroforestry systems adapted to Central American small producers to improve climate resilience and strengthen their food security in agricultural and livestock production systems. The second seeks to strengthen the capacities of national and regional partners in agricultural research, transfer and extension in agroforestry systems, as a way to favour an increase in productivity and food availability for small Central American producers.

Project results

- ✓ Development of management models for the development and establishment of strategies for innovation, by strengthening capacities in agricultural and livestock production for small producers in the Central American dry corridor and small producer organizations, through SAFM Sustainable Agriculture Farm Management (SAFM).
- ✓ Implement of innovation models through demonstration plots with SAFM.
- ✓ Articulation of strategies for knowledge management in SAFM that strengthen the capacities of Research Institutes, Ministries of Agriculture, universities and small producer organizations.
- ✓ The project promoted the adoption of technologies such as bio-input production, soil management and conservation, crop intensification, plant genetic material propagation, productive forest diversification, animal genetic improvement, post-harvest management and food conservation, and the implementation of small-scale water harvesting and irrigation systems.
- ✓ In detail:
  - The project's leading producers and national strategic partners played a central role, contributing through applied research, technology transfer, and agricultural extension with 73 technological solutions in AFS and 34 differentiated technical assistance strategies for projects with producer organizations across over 100 rural communities impacted.
  - Dissemination of gender and youth-focused instruments and mechanisms, such as the "Woman Empowering Woman" program, gender equality training strategies, the "Youth Challenge Agriculture 4.0" for reintegrating rural youth into rural economies,
  - Design of 13 agroforestry models and implementation of 23 agroforestry models adapted to the Central American Dry Corridor.
  - Management of 6 technical and administrative teams in the Region.
  - Management of the reforestation of 50,056 units of forest, fruit and woody species on the project's producer farms.
  - Development of a proposal to demonstrate the potential of the services and digital tools of the Earth
  - Dissemination of the potential of remote sensing, and geospatial analysis with the Observatory and the Copernicus and Galileo programs focused on agriculture.
  - Development of a tool for tracking and monitoring the adoption of innovations and impact of the project in the Region.
  - Development of an Innovation Hub tool to manage all the information generated in the Region.

Lead partner

Interamerican Institute for Cooperation in Agriculture (IICA), Costa Rica

Other partners

In Costa Rica

✓ Instituto del Café de Costa Rica (ICAFE),
✓ Cámara Nacional de Productores de Leche,
✓ Coopeleche, (Cooperativa de productores de leche de Occidente)
✓ Consejo Nacional de Clubes 4s (CONAC 4S),
In Guatemala
✓ Ministerio de Agricultura, Ganadería y Alimentación (MAGA),
✓ Secretaría de Agricultura y Ganadería (ANACAFE),
✓ Instituto Nacional de Bosques (INAB),
✓ Organización rural de productores ASPRECH,
In Nicaragua
✓ Ministerio Agropecuario (MAG),
✓ Instituto Nicaragüense de Tecnología Agropecuaria (INTA)
In Honduras
✓ Ministerio de Agricultura y Ganadería (MAG),
✓ Instituto Hondureño del Café (IHCAFE),
✓ Secretaría de Agricultura y Ganadería - Dirección de Ciencia y Tecnología Agropecuaria (SAGDICTA),
✓ Instituto de Formación Profesional de Honduras (INFOP),
In El Salvador
✓ Ministerio de Agricultura y Ganadería(MAG),
✓ Centro Nacional de Tecnología Agropecuaria y Forestal de El Salvador (CENTA),
✓ Ayuda en Acción,
✓ Proyecto Raíces,
In Panama
✓ Ministerio de Desarrollo Agropecuario (MIDA),
✓ Instituto de Investigación Agropecuaria de Panamá (IDIAP)
✓ Facultad de Ciencias Agropecuarias de la Universidad de Panamá (FCA-UP)
And farmers' organizations identified in the intervention territories.

Contacts

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Email: pedro.avendano@iica.int
Phone: (+506) 2216 0222

Relevant links

https://agroinnova.iica.int/. Official website

https://iica.int/en/press/news/agro-innova-project-eu-and-iica-promotes-network-between-research-centers-and-farmers
https://iica.int/es/noticias/proyecto-agro-innova-de-la-ue-y-el-iica-impulsa-resiliencia-climatica-y/
https://capacity4dev.europa.eu/projects/desira/info/agroinnova_en
https://www.desiraliftcommunity.org/agroinnova-rural-leaders-from-the-americas-explore-agricultural-innovations-at-catie/
https://www.catie.ac.cr/2024/04/23/lideres-de-la-ruralidad-de-las-americas-exploran-innovaciones-agropecuarias-en-el-catie/

Relation to SCAR ARCH SWG PA scope

- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building" with an international dimension, funded by an EU funding authority.
- ✓ This project claims for improving climate resilience and food security for small-scale producers through the use of technologies for staple crop production and livestock farming to preserve biodiversity, increase productivity, and improve the quality of life for families in the Central American Dry Corridor.
- ✓ The project perfectly matches with innovating approaches in agrifood systems and the cooperation with the south. It claims for measurable outcomes which can help in the review on the impact. It involves innovative approaches, the level of research on these approaches need to be estimated.
- ✓ Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical low and middle income Latin America countries.

Overlaps and gaps of the project content compared to the other projects in the portfolio

Let's check the full list of projects to fill out this part. We should compare with relevant agri-food projects in Africa as CDAIS.

13. Agricultural Trade and Market Access for Food Security: Micro -and Macro-level Insights for Africa - ATMA4FS

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap-agri.com/?page_id=321

Funding details

Source of funding: EU Horizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)
Type of project (+ cluster if relevant): LEAP-Agri Cluster 3 'Expansion and Improvement Agricultural markets and trade'

Contract number: 58-ATMA4FS (LEAP-Agri GA No. 727715)

Project total budget (€): € 1 000 095

Start and end date of the project

1 September 2018 – 31 August 2021

Project summary

Agri-food markets in Africa are not well integrated at the local, regional an international level, with trade barriers hampering exports/imports as well as the value chain development. Trade via better market access has the potential to create income and welfare, while improving the food security situation, i.e. providing people in Africa with sufficient food of an acceptable quality level at fair prices. The project looked into opportunities and challenges for expanding local, regional and international trade and market access, while considering supply chains from the African importer/exporter perspective. Specifically, it addressed trade and market access issues in three African countries (Senegal, Ghana and South Africa) and two African trade regions (Economic Community of West African States, ECOWAS, and Southern Africa, SADC) and EU-Africa trade relations. The focus was on three product categories that are important for current and potential African trade: fresh fruits and vegetables, grain products as well as meat. For the countries/regions and products, the project studied how trade and market access are influenced by trade agreements, non-tariff measures, e.g. sanitary and phytosanitary measures, technical barrier to trade and customs procedures and private standards, price trends and volatility, market logistics/infrastructure and institutions.

Project results

- The results provide evidence that supports the formulation of targeted policies and programmes. Furthermore, they will point out how to improve market access by identifying which actors along the supply chain should be targeted.
- Minimization the downsides of existing trade barriers, thereby having an impact on the prevalent realities when producing/selling the respective products at the local, regional and/or international market.
- Generation of opportunities and challenges for expanding local, regional and international trade and for improving access to agri-food markets for different types of actors. Better trade conditions, in particular for agricultural products, constitute a key component for a viable food security strategy in Africa.
- Identification of policy and investment priorities in order to make agricultural trade work for improved food security.

Lead partner

University of Göttingen, Germany

Other partners

- Wageningen University & Research (WUR), The Netherlands.
- University of Ghana (UGHA), Ghana.
- University of Pretoria, South Africa.
- University of Thìes, Senegal
- Katholieke Universiteit Leuven, Belgium
- GroentenFruit Huis, The Netherlands – associated partner
- European Centre for Development Policy Management – associated partner
- Bureau for Economic Research, Stellenbosch University, South Africa – NWO

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Phone: +49 (0)551 / 39 - 23908/09,

Relevant links

https://library.wur.nl/WebQuery/leap4fnssa-projects/58 FNSSA project database.
https://knowledge4food.net/wp-content/uploads/2018/11/181129_LeapAgri_projects-information-booklet.pdf LeapAgri Funded Projects Booklet.
https://knowledge4policy.ec.europa.eu/projects-activities/atma4fs-agricultural-trade-market-access-food-security-microandmacro-level_en Knowledge for Policy database.

https://service.ble.de/ptdb/index2.php?detail_id=541101&ssk=PTDB-alles&site_key=141&zeilenzahl_zaehler=8953&pId=541101&dId=79092928 Project final report.
https://ddfiankor.com/papers/erae2021_policybrief.pdf Policy brief on agricultural standards differences across countries, and how they have consequences for trade and product prices.
https://www.leap4fnssa.eu/wp-content/uploads/2021/02/Revised-Projects-Study-FINAL_CS.pdf. Study on the projects funded to support the FNSSA Partnership A report submitted by Agricultural Research Council (ARC) of South Africa and Swedish University of Agricultural Sciences (SLU) to the LEAP4FNSSA project.
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Relation to SCAR ARCH SWG PA scope

- ✓ Interesting proect targeting research and innovation at the governance level of agrifood systems in Africa.
- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building" with an international dimension, funded by an EU funding authority.
- ✓ Focus on the transformation of agrifood systems (from primary production to diets)
- ✓ Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical with a special attention to the strategic partnerships of the EU (Africa, Mediterranean, Latin America) and the low and middle income countries.

Overlaps and gaps of the project content compared to the other projects in the portfolio

Let's check the full list of projects to fill out this part. Check and compare with projects in nutrition.
Let's look for innovation impact in terms of business creation and new opportunities.

14. Enhancing food and nutrition security through promotion of edible insects value chain in Eastern Africa Ento-Economy

PROJECT INFORMATION

Source(s)

LEAP-Agri website: https://leap-agri.com/?page_id=307

Funding details

Source of funding: : EU Horizon 2020 ERA-Net Cofund LEAP-Agri (A Long term EU-Africa research and innovation Partnership on food and nutrition security and sustainable agriculture)
Type of project (+ cluster if relevant): LEAP-Agri Cluster 2 'Agriculture and Food Systems for Nutrition projects'

Contract number: 49-ENTO-ECONOMY/ 01DG18023 (LEAP-Agri GA No. 727715)

Project total budget (€): /

Start and end date of the project

1 September 2018 – 31 August 2021

Project summary

Ento-Economy project was aimed to contribute to addressing malnutrition in general through 'developing sustainable insect-based value chains for improved food and nutrition security in Kenya and Uganda. Insects contribute to the human food chain either by direct consumption or indirectly as feed for domestic animals when farmed as mini-livestock. Cricket and grasshopper farming models have been successfully established in Kenya and Uganda with farmers being trained and supported to take up the venture as a business. However, edible insect value chains remain under-developed, therefore limiting their contribution to food and income security in the region. Ento-Economy project aims to unlock the potential of edible insect value chains in Kenya and Uganda. The project intended to establish a multi-stakeholder alliance for improving and strengthening insect value chains; evaluate and disseminate models for mass production of crickets and grasshoppers by women and youth micro, small and medium enterprises (MSMEs); enhance commercialization by youth and women managed MSMEs, enhance utilization and consumption of insects, insect-based products and products of animals raised on insect-based feed; and enhance the social, policy and regulatory environment for use of insects as food and feed in Uganda and Kenya.

Project results

- Governance of value chain established and strengthened
- Knowledge on insect farmers increased to 2000 farmers
- Uptake of insect farming as an enterprise by 40 MSMEs
- Increased production of edible insects among 40 farmer groups
- Increased mass production of insect colonies
- Develop at least 2000 farmers and 40 MSMEs in insect related businesses
- Policies in support of insect integration in the food and feed industry are put in place
- Insects are integrated in food and feed value chains
- Farmers linkages to markets are developed and sustained
- Increased utilization of insects and insect foods by 2000 households;
- Increased knowledge of preparation, and storage of insects
- Insects are integrated in the food and feed industry
- Improved enabling environment for insect production and marketing
- Organized and strengthened Insect value chain
- Increased food security for 2000 households
- Enhanced livelihoods for 200 households through commercialization of insect value chains
-

Lead partner

Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya

Other partners

- Makerere University, Uganda
- Katholieke Universiteit Leuven, Belgium
- Rhine-Waal University of Applied Sciences, Germany

Contacts

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Relevant links

https://library.wur.nl/WebQuery/leap4fnssa-projects/58 FNSSA project database.
https://knowledge4food.net/wp-content/uploads/2018/11/181129_LeapAgri_projects-information-booklet.pdf LeapAgri Funded Projects Booklet.
https://knowledge4policy.ec.europa.eu/projects-activities/ento-economy-enhancing-food-nutrition-security-through-promotion-edible-insects_en Knowledge for Policy database.
https://leap-agri.com/?aiovg_videos=ento-economy Project video
https://www.youtube.com/watch?v=OaMlMT-V5jQ. Youtube presentation of the project.

https://www.agrar.hu-berlin.de/en/institut-en/departments/daoe/agrifoodchainmanagement/Research/concluded-projects/ento-economy

https://www.tropentag.de/2020/abstracts/posters/303.pdf On-line poster Value addition and off-season market participation among retailers in the grasshopper value chain in Central Uganda

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Relation to SCAR ARCH SWG PA scope

- ✓ This project really targets food system transformation by the integration of insect proteins in the food or feed chain in Africa.
- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building" with an international dimension, funded by an EU funding authority. Focus on the transformation of agrifood systems (from primary production to diets). Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical with a special attention to the strategic partnerships of the EU (Africa, Mediterranean, Latin America) and the low and middle income countries.

Overlaps and gaps of the project content compared to the other projects in the portfolio

Let's check the full list of projects to fill out this part. Check and compare with projects in nutrition.

Let's look for innovation impact in terms of business creation and new opportunities.

15. Locally-driven co-development of plant-based value chains towards more sustainable African food system with healthier diets and export potential - InnoFoodAfrica

PROJECT INFORMATION

Source(s)

Cordis website: https://cordis.europa.eu/project/id/862170
Project website: https://www.innofoodafrica.eu/

Funding details

Source of funding: EU Horizon 2020 funded under SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy; H2020-SFS-2019-2
Type of project (+ cluster if relevant): RIA - Research and Innovation action; H2020-SFS-2019-2

Contract number: Grant agreement No. 862170

Project total budget (€): € 6 465 893

Start and end date of the project

1 August 2020 – 31 January 2024

Project summary

InnoFoodAfrica intended to improve the sufficiency of nutritive food for the African people when consequences of climate change hit hard the agricultural productivity. The main objective was to develop new sustainable crop value chains (VCs), to produce and distribute diverse and healthy foods from African smallholder farms to local and export markets by empowerment of smallholder farmers and SME entrepreneurs. The challenges were tackled by 1) identifying opportunities and bottlenecks of the present VCs, 2) training stakeholders to produce and market diverse and healthy foods to local and broader markets. The RDI work focused on strategic African food crops (selected based on abundance, resilience in changing climate and intrinsic significance) in the partner countries (Ethiopia, Kenya, South Africa, Uganda) by developing climate-resilient agrofood systems, nutritious foods and bio-based materials. This was achieved by adapting technologies to the selected crops. Technology adaptation was combined with training and communication activities to enforce better farming practices and healthier nutrition. The most promising new food solutions were assessed for business feasibility. The project

was designed by a strong multidisciplinary consortium of 20 partners, dominated by 15 African actors from all four focus countries with deep understanding of local needs, and supported by 5 European partners.

Project results

- ✓ InnoFoodAfrica has introduced several key innovations aimed at transforming the agricultural and nutritional landscape in Africa. These innovations include improved seed varieties for enhanced yield and productivity, along with comprehensive training manuals and videos on best practices in farming and seed management.
- ✓ Nutrient-dense food products have been a significant focus, resulting in around 15 healthy flours and food prototypes, including crackers, composite bread, quick-cooking grains and pasta. The project adopted low-energy pretreatment practices to ensure year-round crop availability while exploring the use of non-edible parts, such as stems and leaves, as biocomposite materials for packaging and other purposes.
- ✓ Moreover, the project developed the African innovation platform to promote innovative solutions in Africa by engaging local, national and international stakeholders for widespread technology and knowledge transfer. A networking map with information on potential stakeholders is available to facilitate future collaborations. Viable solutions for the long-term operation of the innovation platform will help ensure the developed technologies and products reach markets in both Africa and Europe.
- ✓ In terms of consumers, the nutritional needs of vulnerable groups (small children and women of reproductive age) were assessed by collecting new dietary data from urban and semi-urban areas in Ethiopia, Kenya, Uganda, and South Africa. Through tailor-made questionnaires, the team also assessed food choice motives and attitudes towards the products created in the project across different countries.

Lead partner

TEKNOLOGIAN TUTKIMUSKESKUS VTT OY, Finland

Other partners

13 African partners with local knowledge and on-field expertise and 4 EU Partners with forerunning R&D expertise:

- University of Pretoria, South Africa.
- Delphius Technologies & Consultancy
- VTT Technical Research Centre of Finland Ltd . Finland
- University of Helsinki, Finland
- Nofima As Norway
- Makerere University Uganda
- Uganda Manufacturers Association Uganda
- Food and Nutrition Solutions Limited Uganda

- Kulika Uganda
- Institut National d'Etudes Superieures Agronomiques de Montpellier France
- Addis Ababa University Ethiopia
- Organisation for Social Science Research in Eastern and Southern Africa Ethiopia
- Amhara Regional Agricultural Research Institute Ethiopia
- Guts Agro Industry Plc Ethiopia
- Chuka University, Kenya
- University of Nairobi Kenya
- Enterprises and Services Limited, Kenya
- Africa Harvest Biotech Foundation International, Kenya
- Puratos Belgium

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TEKNOLOGIAN TUTKIMUSKESKUS VTT OY, Finland

Relevant links

https://www.innofoodafrica.eu/
https://www.linkedin.com/company/innofoodafrica
https://cordis.europa.eu/project/id/862170
https://www.innofoodafrica.eu/publications/
https://www.innofoodafrica.eu/brochures/Nutritional%20recommendations.pdf
https://library.wur.nl/WebQuery/leap4fnssa-projects/partnership/213
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4642025
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https://www.sciencedirect.com/science/article/pii/S0195666323024637?via%3Dihub
https://journalejnfs.com/index.php/EJNFS/article/view/1325

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Relation to SCAR ARCH SWG PA scope

- ✓ Interesting project promoting research and innovation to support food systems transformation towards the inclusion of more plant based diets.
- ✓ Relevant project within the last 10 years related to the continuum "research-innovation-impact-capacity building" with an international dimension, funded by an EU funding authority.
- ✓ Focus on the transformation of agrifood systems (from primary production to diets). Interdisciplinary, transdisciplinary and multi-actor, comprising many geographical with a special attention to the strategic partnerships of the EU (Africa, Mediterranean, Latin America) and the low and middle income countries.
- ✓ Geographical focus: Southern and Eastern African countries of South Africa, Ethiopia, Kenya, and Uganda and European export markets-

Overlaps and gaps of the project content compared to the other projects in the portfolio

Let's check the full list of projects to fill out this part. Relation with nutritional projects.

They claim for the development of new products and new food channels. Let's look for innovation impact in terms of business creation and new opportunities.