

Overarching objective: promoting sustainability in challenging times

The overarching objective of the cooperation between FAO and CNR, CREA, ENEA and ISPRA is the promotion of sustainability at large in the context of joint efforts for the attainment of Agenda 2030 and its SDGs.

This will include:

- Focusing on knowledge sharing, advocacy, capacity development, gender and youth empowerment as a transversal objective of collaboration;
- Aiming to improve policy and decision making processes based on scientific and technical best available knowledge and building a science-policy interface;
- Paying special attention to the agricultural, environmental and socio-economic challenges of the African, Mediterranean and Middle Eastern geographical regions, while not excluding cooperation focused on other regions;
- Jointly promoting communication initiatives aimed at enhancing the impact and visibility of the activities undertaken in the context of the Memorandum.
- Promoting participatory approaches and methods through people's participation and collaboration among different institutional and social actors. Encouraging organizational structures in acting on co-innovation and co-creation principles. The participatory approach increases the likelihood that actions taken provided by institutions reflect the needs of people and that the benefits of development are more equitably shared. As such, public participation has been recognized as one of the core principles of sustainable development. Participation means contributing to development, benefiting from development and taking part in decision-making about development, which could be realized through activities facilitated by authorities as well as activities initiated or generated by the people themselves.

Exploring opportunities for collaboration on issues related to (i) agriculture and climate change, (ii) food quality and nutrition, (iii) value chain development through a systemic approach to local innovation, (iv) land and water management and ecosystems quality and (v) valorization of biological and social resources in shifting toward sustainable land-use patterns and healthy food. Jointly developing projects, programmes and initiatives eligible for potential funding by a wide gamut of national, regional and global sources, as well as exploring possibilities for secondment of staff and researchers. Common projects and activities could be developed in the framework of EU or other international funded initiatives in the Mediterranean region, aiming to support countries in terms of innovation, cooperation and technology transfer in key sectors such as agriculture, land and water management, in particular the Water-Food- Energy nexus. Examples of on-going actions which could be used as a reference due to their added value, include *PRIMA*, a long term and wide joint research and innovation programme involving EU (Cyprus, France, Greece, Italy, Luxembourg, Malta, Portugal, Czech Republic, Spain) and non-EU (Egypt, Jordan, Lebanon, Morocco, Tunisia e Turkey) countries of the Mediterranean basin.

1. Agriculture and Climate Change

Agriculture is an essential node of the nexus linking population growth with the need of healthy and nutritious food, energy, and water. An estimated 60% increase of global agricultural production will be needed by 2050 (FAO, UN) to match the current trends in population growth and food consumption. This will have dramatic consequences on the environment being agriculture now responsible for

more than 30% of anthropogenic greenhouse gas emissions globally released, and substantially changing the climate of the planet. On the other hand, agriculture can effectively contribute to reduce climate-altering gas emissions through direct CO₂ fixation by photosynthesis, and producing renewables (energy and chemicals) from biomass. Moreover, managing soil microbial diversity combined with agroecological practices for land management, which needs still to be explored, represents a potential and innovative solution for transforming the agricultural sector from a problem into a solution. In addition, the adoption of proper sustainable agricultural practices and the use of climate-ready organisms (through genotyping and phenotyping-assisted selection) and microbial biofertilizers can substantially reduce the environmental impact otherwise generated by the intensification of agriculture using conventional practices (e.g. herbicides, pesticides, plant protection products and synthetic fertilizers). Reconciling sustainable food production with the fight against climate change will be a future challenge, also requiring further and interdisciplinary research to implement innovative and effective solutions. Areas of collaboration include:

- Plant response, and adaptation to single factors and combined effects of climate change;
- Optimization of agriculture and forestry as main sinks for CO₂ and other GHG driving climate change;
- Sustainable integrated research system on agricultural soils to improve resilience, health, and productivity of soils;
- Sustainable agriculture based on selection of proper genotypes and exploitation of crop wild relatives under low water availability and other climate change-exacerbated constraints;
- Impacts of extreme climate events and environments and mechanistic understanding of resilient plants (climate-ready) and agroecosystems;
- Investigating and selecting novel genetic and phenotypic traits conferring resistance or tolerance to biotic and abiotic stress while increasing the quality value of food and feed;
- Biodiversity conservation, ecosystem conservation and valorization of genetic resources (in situ, ex situ) under fast climate change conditions;
- Sustainable agricultural soil management, for improved carbon sequestration, beneficial microbiota, fertility, and for counteracting erosion and soil degradation;
- Advanced alert, control, and management systems for new pests and diseases, and alien species invasion driven by climate change;
- Exploring options for agroecological practices to leverage the role of below and above ground biodiversity in transitioning to farming done with more ecosystem services and less exogenous inputs;
- Exploration, mapping and valorization in forms of ecosystem services to the agriculture of the multiple functions of soil microbiome;
- Redesigning science-policy interfaces to promote information and support the development of policies enabling the transformation of the agricultural sector from a key problem to a key solution in adapting to climate change, market fluctuations and changes in citizens' demands for more sustainable and healthy food.
- Introducing digital innovations known as “precision farming” to optimize farm management, reducing inputs (water, fertilizer, pesticides, energy), preserving resources (soil, environment, biodiversity) and improving food production and quality.

2. Food quality and nutrition

Particular attention will be focalized on innovation in technologies, tools and protocols aimed at improving knowledge and awareness on the importance of food quality and human nutrition.

The intensification of agricultural productions must be obtained by the sustainable management of

natural resources (soils, water, forests, etc.) according to the sustainable developmental goals (SDGs) of the Agenda 2030. In line with the “One Health” paradigm, programs and policies will be developed aimed to work together to guarantee a good state of nutrition and prevent the onset of chronic non-communicable diseases creating links among different professionals with a range of expertise active in different sectors, such as public health, animal health, plant health and the environment.

Areas of collaboration include:

- Agricultural techniques to improve the quality of soils for healthy life: foods with the nutrients calibrated on local soils characteristics to avoid malnutrition;
- Local mapping on polluted or contaminated soils/water/environment to attain food safety;
- Training instruments addressed to farmers on food quality, nutrition and risk assessment;
- Regional dataset on primary dietary data, food composition tables with a focus on typical and local products, and guidelines on nutrition.
- Valorization of animal, plant and microbial resources for high quality food productions.
- ICT and digital technologies for improved food quality, personalized diets and reduced waste;
- Addressing the food waste issue at primary production through agroecological farming and territorial strategies for valorization of social and biological resources.
- Improving and spreading knowledge on sustainable diets as incorporating quality, nutritional value, correct food behavior and lower impact on the environment

3. Value addition of agricultural products and by-products, bio-economy and circular economy

FAO and partner institutions will jointly explore opportunities for collaboration on issues related to value chain development through a systemic approach to local innovation and youth inclusiveness. The final objective is the enhancement of farm income and the improvement of rural livelihoods, the creation of new and better jobs, especially for youth, the reduction of the environmental footprint of agricultural production and a reduction of agricultural waste in the framework of circular economy and bio-economy perspective. Areas of collaboration include:

- Development of agro-food processing and post-harvest technologies (including biotechnologies) for value addition of agricultural products to facilitate access to domestic and export markets;
- Youth-centered value chain selection and assessment, and support to youth agripreneurs;
- Certification and traceability of agricultural products;
- New strategies on food bio-economy (increasing shelf life, re-using, transforming, waste of food production as raw material for production of fertilizers, feeds, animal nutrition, etc.)
- Use of agricultural by-products and waste for energy production and recovery of high added value compounds;
- Use microbial processing to agricultural residues to increase the nutritional quality of food;
- Evaluation of the environmental footprint of agro-food products and industries;
- Monitoring and assessment of food waste.

4. Land and water management, biodiversity conservation and ecosystems quality

Thorough and cross-sectorial monitoring and assessment activities are key to improve the knowledge of state and trends of ecosystems, their various components and their interactions. Sustainable land

and water management are two pillars to protect and/or maintain the provision of ecosystem processes, including the natural mitigation of hydrological extremes such as floods and drought. Environmental monitoring and planning procedures integrated according to a DPSIR concept, lead to a broader understanding of the processes and to the design appropriate and effective measures to avoid or mitigate the loss of ecosystem services. The integration of environmental issues is also useful for designing and implementing targeted programmes and projects. Common activities will also support FAO commitments for SDG Indicators as Custodian Agency (e.g. water use and water stress, biologically sustainable levels of fish stocks, implementation of international instruments for sustainable fisheries, forest monitoring and sustainable management) or as Contributing Agency (e.g. land degradation, conservation and sustainable use of the oceans and their resources and biodiversity policy frameworks). Thematic areas of collaboration include:

- Long -term conservation and sustainable use of marine living resources in the high deep seas, including the prevention of significant adverse impacts (SAIs) on vulnerable marine ecosystems (VMEs).
- Scientific methodologies for detection of seafood and fish contamination (e.g. heavy metals, organic compounds, plastic debris), in order to protect the marine environment.
- Assess the sustainability of aquaculture in terms of environmental and biosecurity risks and benefits of the sector.
- Enhancing more environmentally performant aquaculture models, including diversification to lower trophic species (invertebrate
- Sustainability assessment of fishing of species of commercial interest also in relation to climate change through ecosystem approach analysis and assessment of measures for the implementation of the FAO Deep-sea Fisheries Guidelines consistent with the Ecosystem Approach to Fisheries (EAF), in order to protect the marine environment.
- Study on the effects of climate change on coastal erosion and flooding: the response of biodiversity to habitat disruption and fragmentation, and species losses.
- Sustainable water management practices to protect and enhance the provision of ecosystem services.
- Prevention and mitigation of the impacts of invasive species to safeguard biodiversity and ecosystem services, including human and productive and natural ecosystems health.
- Urban growth, urban sprawl, land take and soil sealing analysis and mapping, for facilitating peri-urban agriculture and forestry in increasingly urbanized society.
- River habitat mapping and assessment through dedicated tools based on satellite data/services.
- Land monitoring and land use/land cover classification, mapping and assessment in the framework of advanced satellite methods and data/services.
- Terrestrial ecosystem and land degradation/restoration mapping and assessment, development and analysis of related indicators
- Impact of global and regional deforestation and degradation on the environment, including loss of habitat and green-house gas accumulation into the atmosphere.
- Development of integrated forest monitoring programme for coordinating and harmonizing inventorying, maximizing the use of the data collected in order to restore degraded forestry ecosystems, out planting and tending.

Cross cutting activities

Incorporate the participatory approach into food policies, and disseminate information on the

methods, techniques and tools validated by agricultural and food systems and to replicate them in other areas, through training initiatives.