

Implementing multifunctional and integrated productive approaches to improve socioeconomic sustainability and develop rural marginal area: a bet for the future of agriculture

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Introduction

The United Nations 2030 Agenda includes the European “Green Deal” as an essential part that sets ambitious goals for the economy and for the agricultural sector, aiming to preserve natural resources and achieve climate neutrality by 2050. This document highlights the key role of the agri-food sector and the importance of the “Farm to Fork” strategy as an operational tool to implement the “Green Deal” in the agricultural sector. The challenge of next generation agriculture will be to provide sufficient, nutrient, and safe food for an ever-greater number of people, creating new models that integrate productivity, reduced use of resources, energy and production inputs, decarbonization, and socio-economic-cultural development. This is a global defiance, set in a difficult context of unstable climate, growing competition for land, water, and energy, in an increasingly urbanized and globalized world.

How to shape future agricultural and rural systems to achieve a safe operating space is becoming a key question for researchers and policymakers. Stimulate and support the sustainable development and productivity of rural areas that are currently disadvantaged and marginal from a socio-economic point of view is one of the focal points for tackling this challenge, together with transversal actions, such as: i) promoting resilience of agricultural systems to the current climate crisis; ii) reducing waste and environmental impact; iii) developing strategies to increase the circular economy; iv) promoting safety, traceability and typicality in agri-food supply chains. To achieve these objectives, research activities must be conducted aimed at identifying operative solutions for rural and marginal areas at risk of degradation and abandonment, gathering stakeholders and promoting sustainable innovations in agricultural techniques for agri-food and non-food farms and companies. Specific actions must be focused to the maintenance of the territory, ecological balance, plant and animal biodiversity, rural landscape, traditional productions, rural built heritage, and development of rural tourism. It is necessary to identify specific plant and animal genetic resources for marginal areas to promote multifunctional production systems (food and non-food), ornamental or medicinal species functional to landscape and territory management. The presence of critical factors such as territorial instability and environmental or climatic difficulties also require new models of integrated production to promote forestry-wood, agri-food, and alternative supply chains with a view to the cascade use of natural sources for the restoration of local economies.

These expectations have been implemented in the Italian AGRITECH - National Research Center for Agricultural Technologies, which is part of the National Recovery and Resilience Plan “Strengthening research structures and creation of ‘national

champions of R&D’ on some Key Enabling Technologies” financed by the European Union – NextGenerationEU.

One of the lines of research of this wide project is aimed at the implementation of integrated models for the development of marginal areas, which favor the multifunctionality of production systems and improve the agroecological and socio-economic sustainability of agricultural activity. The task focused on “Identification of sustainable animal derived resources, crops, ornamental and medicinal plants” adapted to Italian marginal areas is addressed to test their ability to promote an integrated economic development and valorization of the landscape. Within this frame, it is carried out the identification, characterization, and valorization of species suitable for marginal areas in selected disadvantaged marginal areas northern part of the Apulia region (south Italy). It includes several activities aimed at the enhancement of food- and non-food supply chains. These, activities starting from the analysis of the pedoclimatic characteristics of the monitored areas, including the characterization of the microbiome of the rhizosphere and the plant, explore the biodiversity of genotypes of halophytes and of local woody fruit crops to evaluate their environmental adaptability, characterizing them from an eco-physiological, qualitative, and nutritional point of view. Furthermore, the biological activity of extracts of medicinal plants and halophytes for the control of harmful arthropods and fungal pathogens is evaluated, as well as the antimicrobial activity of those extracts, the biostimulating effect of Plant Growth Promoting Bacteria (PGPB) autochthonous and/or allochthonous on halophytes, and the effect of essential oils on in vitro immune responses of lympho-monocytes of farm animals. These research activities are carried out by means of field trials, sustainable innovative strategies based on mycorrhizal soil inoculation and/or zeolites foliar application to reduce crop water

requirement, pest/diseases control by monitoring of phytophagous insects employing chromotropic or activated traps with specific sexual pheromones and visual sampling on vegetation to detect biological stages of insects and mites, pathogens (mycoplasma, viruses, bacteria, fungi) and related damage. The implementation of this study involves collaboration and integration between research groups with different scientific expertise, also sharing the available infrastructures and equipment. From this complex study the definition of integrated approaches for improving the environmental and economic sustainable cultivation in marginal areas is expected. Combining the best research skills necessary to adequately address, in a truly multidisciplinary context, the multiple problems associated with sustainable agriculture is one of the general objectives of the AGRITECH project, as well as co-designing research and making the most of the results to increase

the resilience and economic competitiveness of agri-food supply chains aimed at training the next generation of scientists and managers to generate the necessary human capital and skills to the development of society.

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Conflicts of Interests

None.