



## SUSTAINABLE AGRO-INDUSTRIAL SUPPLY CHAINS

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The European Commission document on the European Agricultural Policy 2021-2027, entitled "The future of food and agriculture", reports the need to favour a "smart" and resilient agricultural system, very helpful in taking care of the environment by means of the use of new technologies, which implement the actions to mitigate the effects of climate change. Agriculture can be considered one of the major water consumer, with an increasing trend in the next future. Irrigation plays a fundamental role in increasing crop yield by 2-3 times compared to non-irrigated lands. Irrigated crops continue to expand at an annual rate of 0.6%. In some areas, the water withdraw for irrigation is greater than the natural capacity for its reintegration, with the consequences of salt accumulation in the soil and water resource depauperation (1). Under the perspective of water sources safeguard, the use of "smart" IOT (internet of things) technologies (2), which by remotely controlling and manage the water resources, can help to minimize losses, with positive impact on cultivation costs and crop productivity. Besides this, a further contribute to the future environmental-friendly management of the resources can imply post-harvest preservation methodologies, since they can increase the shelf-life of the product without changing the quality.

The aim of my PhD project is to study smart technologies solutions suitable for agro-industrial supply chains in Sicilian marginal areas, evaluating the possible benefits in terms of quality, sustainability and feasibility of the process. This objective-meets the interest of enhancing local agriculture by making available to growers the methods and the technologies at low environmental impact and economically sustainable. The project will consider, as a case study, the prickly pear cactus (*Opuntia ficus indica* L.), an arid resistant crop, mainly cultivated in Sicily (90% of the national supply). The species is a CAM (Crassulacean Acid Metabolism) plant rich, very rich in mucilage that helps plant survival to drought condition; its resilience make the species one of the crop of the future (3). In order to determine the effectiveness of a "smart" water reserve use, field experiments will be carried out in Mazzarino (CL), where cactus plants will be monitored annually in regulated deficit irrigation and non-irrigated field conditions. The effect of the different irrigation conditions will be monitored by determining morphological and biochemical parameters. Seasonally, the yield and the dry/fresh weight ratio will be determined. Cladodes will be sampled, and fruits will be collected in the first and second production phase (bastardoni), each year. The samples will be analyzed for their content and composition of proteins, polysaccharides polyphenols and antioxidant capacity. Mild technologies (membrane filtration) will be applied to mucilage extracted from the cladodes in order to fractioning and enriching the components of the extracts for industrial applications. Downstream the seeds will be recovered and analysed for oil composition. The results obtained will improve the knowledge on the possibility of cultivating on marginal land that would otherwise be abandoned.



## Reference

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