ARSINOE

CLIMATE-RESILIENT REGIONS THROUGH SYSTEMIC SOLUTIONS AND INNOVATIONS

Second Open Tender for Innovations

Case Study #9: Sardinia

Supplementary information

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The Case Study "Sardinia"

The Autonomous Region of Sardinia is the second largest island of the Mediterranean Sea. It covers a total surface of 24,090 km², a total population of about 1.59 million inhabitants, and a population density of 66 inhabitants/ km² (ISTAT, 2020). Concerning agriculture, Southern Sardinia is the main area of the Island; it is divided between the metropolitan area of Cagliari (the capital of the Island), and the province of South Sardinia. This area accounts for 47.7% and 32.3% of Sardinian population and surface, respectively. The climate of the area is typically Mediterranean with warm and dry summers and mild winters and it is classified as semi-arid owing to a total mean annual rainfall of about 450 mm, mostly concentrated between autumn and early spring. Climate change projections for this region forecast an increase of the average temperature, with longer hot and dry periods, alternated by short but intense rainfall events. Water scarcity has always been a crucial issue in this region. Therefore, satisfying the water demand of citizens, agriculture, industry and tourism and finding a balanced management of the water resource are big challenges that need to be addressed, especially considering the future climate conditions. Water supply in Sardinia derives in part from surface water, stored and regulated by several reservoirs spread all over the Island (57%), and in part from groundwater (43%): 17% of the withdrawn total water is supplied for industrial use, 37% for civil use and 46% for agricultural use. Regarding the latter, 30% comes from groundwater and 68% from surface water. About 45% of the total regional water resource is withdrawn in the metropolitan area of Cagliari and south Sardinia. The main extensive crops of the area are durum wheat and other cereals (barley and oats), legumes (fava bean), forage (clovers and lucerne) and artichoke and potato in the most fertile areas. Concerning trees, the most important are: vine, olive and almond trees. In terms of integrated extensive productive systems, the durum wheat chain is the most important in Sardinia. This crop fuels several upstream activities, such as seed production, as well as downstream ones such as milling, bread- and pasta making. However, durum wheat production and yield stability are seriously threatened by climate change, thus jeopardizing food security and social stability in the whole Mediterranean basin. Concerning Sardinia, a decreasing production trend has been registered due to low profitability and unfavourable growing conditions caused by climate change, with projected average yield declines between 16% and 19% in the southern durum wheat growing areas. As a result, the average durum wheat production in Sardinia declined from about 140,000 tons in the 2006-2008 period to 54,000 tons in the 2018-2020 period. Given a demand of more than 160,000 tons, import of durum wheat is necessary. If this imbalance would occur in poor areas of the Mediterranean region, it could generate a serious threat to food security and trigger migration processes.

The Living Lab "Sardinia"

Cereals are the pillars of food security worldwide. In the Mediterranean areas, including Sardinia, durum wheat and its end-use products (i.e. pasta, couscous, and traditional breads) play a crucial role in preserving food security. Since climate change is seriously threatening staple food production based on cereals, particular emphasis to this crop, its upstream (e.g. certified seeds) and downstream (e.g. pasta and bread) products, as well as its related focus areas (water and energy) in Sardinia Case Study was given.

Hence, stakeholder choice was basically linked to this crop and to its agricultural- and economic-related activities. As these central themes of the case study are broad-ranging issues, four different scales in the initial stakeholder long list were included: (1) International; (2) National; (3) Regional; (4) Local actors from these main sectors: Agriculture, Agri-Food, Construction, Culture, Economy, Energy, Environment, Financial, Food, Handicraft, Maritime, Media, Social, Technology, Tourism and Water.

Finally, stakeholders belonging to regional government and policy makers, research, business, farmer associations, handcraft and industry categories were selected in the short list and involved in the Living Lab activities. During the workshops, the present and future challenges posed by climate change were discussed and a vision of climate-resilient future in the region in 2050 was developed. In this viewpoint, potential innovations to attain the desired future for Sardinia were identified.

In this tender for innovations, an ambitious contribute to fulfil and solve the identified challenges in order to make that vision a reality is required.

The Problem Statement by Stakeholders

General discussion during the three workshops of the Living Lab led to this final statement: "*How to enhance and stabilize sustainable and resilient food production under conditions of climate change and limited production inputs, such as land, water, energy, and others (fertilizers and pesticides)?"*

This statement was generally agreed after discussing the main challenges of Sardinian case study, summarized as follows:

- increasing air temperatures, more erratic rainfall and increased year-to-year variability;
- increasing extreme events (more frequent and longer lasting heatwaves and drought; short and intense rainfall events);
- declining production and yields of the main crops, particularly in rainfed conditions;
- negative impacts on food and social security in the long-term period.

From these starting points, the discussion among stakeholders highlighted the following issues:

- limited access to information and solutions to address climate change, optimize sustainable crop management, and limit agricultural inputs;
- lack of awareness, information and training of food supply chain actors on climate-related issues;
- inequalities in access to quality food and lack of transparency on food origin;
- low capacity for producer aggregation and reduced regulation and incentives for short food supply chains.

The final statement will be the guideline leading this tender for innovations in the Sardinian case study.

The Vision of a climate-resilient Future

The final vision co-developed with the stakeholders during the Living Lab is stated below:

"The Sardinia 2050 will be a successful reality for agricultural production. There will be a re-appropriation of agricultural lands by farmers. New crop management techniques will be adopted and new varieties will be selected to tackle increasing temperature and more erratic precipitations due to climate change in Mediterranean conditions. Agricultural technology and machinery as well as more efficient use of water resources and renewable energy will be implemented. New control technologies for extracting ground waters and reducing salinization will be used and interconnected reservoirs to cope with drought periods will be enhanced. Durum wheat and cereals will be more profitable and farmers producing more sustainably will be rewarded. Integrated agriculture and precision farming will be commonly applied, and soil ecosystem services will be valued. Reliable seasonal forecasts will be implemented to optimize timing and crop management interventions. Sustainable agronomic inputs, including the use of organic fertilizers from circular economy, will be widespread. Training for agricultural workers will be provided, dialogue between all actors of the food supply chain will be enhanced, and there will be greater awareness in consumer choices in favor of sustainable, locally-produced foods. Food waste will be minimized through increased information and awareness among producers and consumers. Information to cope with climate change will be free and available for all. Climate-resilient policies will be implemented to lead the sustainable and resilient agricultural development of Sardinia, meeting the challenges of the SDGs".

The Key Challenge for the second Tender for Innovations

The key challenge for the Sardinia case study is to improve sustainable food production and resilience of agricultural systems under climate change, in order to guarantee food security and quality. The main goals to be achieved to accomplish this challenge are: (1) stabilizing and/or increasing crop production while optimizing agricultural inputs (e.g. irrigation water, fertilizers); (2) increasing local food production; (3) enhancing awareness and information of all the main actors of the food chain, including consumers; (4) achieving zero waste.

Addressing this challenge implies a multi-disciplinary approach focused on Agriculture, Technology, Circular Economy, Social innovation. While some adaptational measures are already under development and/or partially implemented, there is a need to accelerate these efforts and foster collaboration among various stakeholders in the agri-food chain.

With the constraints of limited resources and changing environmental conditions, the region seeks innovative solutions to guarantee food security and quality. During our collaborative sessions with stakeholders in the living lab, the following potential solution categories emerged:

- **Digital Adaptation**: The development and integration of digital technologies tailored for farmers, such as weather forecasting tools, Decision Support Systems, and blockchain applications.
- **Certification Branding and Consumer Awareness**: Implementation and promotion of certified products that emphasise quality, sustainability, and origin supported by platforms and/or applications designed to enhance consumer knowledge and appreciation for sustainable and local food products.

- **Technological Integration**: Incorporation of innovative sensors, water storage systems, and other technologies powered by sustainable energy.
- **Zero Waste**: Development and widespread of innovative agronomic inputs from Circular Economy to guarantee sustainable crop production (e.g. organic fertilizers, amendments, etc.).

Additional requirements for applicants of the 2nd Open Tender for Innovation

Impact Relevance for Sardinia: Proposals originating from outside Italy must demonstrate a clear and tangible impact on the Sardinia case study. This requirement ensures that the funding is allocated to innovations with a direct and significant benefit to the region.

Declaration of Funding Sources and Intellectual Property Rights (IPR): Applicants must provide a formal declaration confirming that no financial contributions from other public bodies or institutions have been used or received for the proposed activities, affirming the applicant holds all necessary intellectual property rights related to the innovation. This will be addressed at the negotiation stage of the contract signature with the selected innovators.

Moral, Political, and Civil Compliance Declaration: It is mandatory for applicants to submit a declaration stating compliance with moral, political, and civil obligations. This includes the absence of convictions for crimes against the Public Administration and the maintenance of civil and political rights. This will be addressed at the negotiation stage of the contract signature with the selected innovators.

Compliance with Social Security Contributions (for Italian Innovators): Italian applicants are required to declare their regularity in the payment of employees' social security contributions. This clause ensures adherence to national labour laws and ethical employment practices. This will be addressed at the negotiation stage of the contract signature with the selected innovators.

Grant Ceiling and Applicant Selection: The maximum grant amount available for each selected innovation under this tender is set at €30,000. The aim is to select a total of three/four applicants who best meet the tender criteria and demonstrate the potential for impactful innovation in addressing the key challenges of CS9 Mediterranean Island/South Sardinia. This financial ceiling is established to ensure an equitable distribution of resources and to foster a diverse range of innovative solutions.