

Course 2: Management of agro-food resources adapted to climate change for a sustainable Mediterranean agriculture

Course Director: Domenico Pignone

Masters' degree required: Agricultural Sciences, Forestry, Animal Production Sciences, Food production Sciences, Veterinary Sciences, Life Sciences, Natural Sciences, Biotechnology, Environmental Sciences

The Mediterranean basin represents one of the world's most complex systems, as it includes countries bearing many different characteristics in terms of economic structures and productive systems, as well as of ecosystems and culture. Nevertheless Mediterranean countries have developed, and are still developing, on the basis of a long history of interaction and integration.

Furthermore Mediterranean agriculture represents an important asset for regional cooperation given its critical role at world level with 90% of olive oil production, 65% of the wine production, 20% of citrus production and 10% of cereal production. Strengthening cooperation and expertise in the agricultural sector would not only support sustainable development at National level but also the role of the Mediterranean region as a global actor.

Mediterranean countries are confronting with new production and economic models to face challenges that countries such as Italy have already faced since the Second World War, with particular reference to the problems associated with the loss of indigenous plant genetic resources. This loss is due to changes of primary production systems, to pressure of the increasing domestic demand, modification of food preferences and to the need to adapt their production systems to reduced water availability. In addition, the Mediterranean is one of the geographical areas where climate change is expected, and already observed, to impact on agro-ecosystems with greater intensity. These conditions pose a high risk of genetic erosion on Mediterranean crops, which constitute a resource of the utmost importance to mitigate the effects of climate change on primary production and for the development of new varieties highly adapted to the changing conditions of the region. The course aims to provide participants with the basics and experience to plan a mindful and sustainable management of local resources, in line with the recommendations and the methodologies internationally adopted.

The course is designed to facilitate interdisciplinary cooperation as the most appropriate approach to respond to the complexity of agricultural sector and to the demand of innovation in terms of methods and techniques. By this end, genetic resources management, adaptation of food production systems to climate change and sustainable crops protection represent three key themes for transfer of know-how between the two sides of the region.

The course is designed with a common introductory module on Mediterranean agriculture followed by three parallel modules addressing the three above mentioned themes (genetic resources management, adaptation of food systems to climate change and sustainable crops protection)

Genetic resources management

Participants will be provided with the most extensive knowledge on the origin and conservation of native plant genetic resources, as an instrument on scientific grounds for planning interventions, together with an overview of the legal framework and strategies for implementing programs of plant genetic resources (PGR) conservation, with particular attention to those in force in the Mediterranean countries. The course will also provide guidelines for the development of legislation on PGR in their countries of origin as well as provide practical tools on how to organize and manage a germplasm bank and relevant information, using as an example the Italian framework. The phases of on-job training will focus on the practical aspects of the management of PGR, at different intervention levels:

managing gene banks from the field to the cold stores, alternative methods of preservation (cryopreservation, tissue culture, etc.), managing data on the stored PGR

PGR characterization from morphometric field data to molecular data, and search for genetic determinants of adaptation

interaction of PGR with the biotic and abiotic environment

optimization of water resources through careful use of germplasm and through a proper use of water resources ,

climate change impact on crops production and climate trends

Adaptation of food production systems to climate change

The objective of the module is to reinforce capacities to better evaluate the impact of climate change on Mediterranean agriculture systems, define adaptation strategies at various level and identify research and transfer demand by farmers. By this end the module will address to agricultural meteorological services officials, agricultural and climate researchers, agro-meteorologists, by creating an environment where agriculture and climate actors could share a common view and develop a common language. Furthermore in order to provide operational information and skill in the area of agricultural operational policies, climate services, research and transfer to identify appropriate actions, the module will concentrate on 2020-2030 climate prediction scenarios. Participants aiming at this address should preferentially have academic degree in: Agriculture Science, Physics, Biology, Environment or Geography-Geoinformatics.

Participants will be provided with knowledge on current approaches to :

assess climate change trends on the short and long term

evaluate changes and trends in crop production systems

assess vulnerability and risks to climate change and to extreme hydrometeorological events

evaluate and model climate change impacts on food production systems

adopt agro-meteorological and precision-agriculture strategies for food production systems adaptation.

Sustainable crops protection

Climate change also affects the microbial population of the macro-environment (soil, air and water) and the population of pets or other vectors. Particularly, temperature increase and precipitation pattern changes have a close relationship with the fate, the transport, the growth and survival of both desired (technological microorganisms such as lactic acid bacteria, yeast and fungi involved in the production of fermented fruit and vegetables) and undesired (spoilage and pathogenic) microorganisms.

Another important effect of temperature increase is observed in the distribution range of the insects, which are more frequently observed in areas in which they were not previously present. The expansion/change of insect-pests' range and distribution is not a problem limited to crops alone, but has a bearing on vegetation biodiversity as a whole. In fact, many invasive species possess common traits that allow them to take advantage of the different elements of global change. The presence of new invader species or changes to the prevalence of autochthonous ones would alter the equilibrium of the basic ecosystem with consequences for biodiversity. The course will focus on the main areas of sustainable agricultural systems:

sustainable agricultural practices,

sustainable plant defense systems,

management of toxin producing microorganisms

managing favourable microorganism to sustain plant health,

managing microorganisms useful in transformation process

A final evaluation module will allow to assess in detail the understanding of the topics of the course for each participant, also with the aim to issue a certificate to those who have successfully passed the test.

For more info please visit: <http://www.daa.cnr.it>