

Development of a Climate Change Adaptation Strategy for agriculture in the framework of ADAPT2CLIMA project: the case of Cyprus.

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The Mediterranean region has been identified as one of the most vulnerable areas to climate change. Specifically, temperatures in the Mediterranean are projected to rise significantly by the end of the 21st century, while precipitation is projected to decrease. Climate change is expected to affect many economic sectors, and agriculture is one of the most exposed, as it is highly dependent on climatic conditions (precipitation, temperature, soil moisture, relative humidity) and on the availability of surface and groundwater resources for irrigation purposes. The negative impacts of climate change include reduced crop yields due to high temperatures, increased water demand for irrigation and reduced water availability due to prolonged periods of droughts and water scarcity. Negative effects on agriculture will be exacerbated by damages to crops caused by extreme weather events.

For Cyprus, the climate change impacts refer to a continual, gradual and relatively strong warming, combined by prolonged drought periods and reduction of annual precipitation. Even though agriculture sector in Cyprus is already facing water shortage, climate change is expected to cause greater problems on groundwater quality and quantity in the future, such as increased water demand for irrigation, decreased water availability and deterioration of water quality. Another major problem in the coastal agricultural areas of the island is the overexploitation of groundwater that leads to the penetration of sea water into the aquifer resulting in the salinization of soils, which leads in reduction of crop production.

The LIFE ADAPT2CLIMA (Adaptation to Climate change Impacts on the Mediterranean islands' Agriculture) project aims at building a solid knowledge base on the future climate changes and their impacts on the agricultural sector of three European islands in the Mediterranean basin, namely Crete (Greece), Sicily (Italy) and Cyprus.

In order to evaluate the impacts of climate change and agricultural management practices (e.g. irrigation) in groundwater quality and quantity of pilot areas, hydrological models were used. As pilot areas in Cyprus, four representative areas in agricultural sector of the Island were selected; Acheleia (Pafos District), Kiti (Larnaca District), Pegeia (Pafos District) and Xylofagou (Larnaca District). For assessing the vulnerability of agriculture to climate change, the crop performances of 6 crops, namely barley, wheat, tomatoes, potatoes, grapes and olives -, were simulated under different climatic scenarios in the three islands and in the pilot areas under study by using crop models. In addition, the ADAPT2CLIMA project focuses on reducing vulnerability and increasing resilience to climate change risks by assessing the effectiveness of the available adaptation measures, developing decision support tool (ADAPT2CLIMA tool) for enabling well-informed decision-making for adaptation planning in agriculture and, ultimately, suggesting strategies for the adaptation of the agricultural sectors of the three islands to climate change.

Among the commitments of the ADAPT2CLIMA partners was the development of Adaptation Strategy for their regions, using the results of various project actions. In the case of Cyprus, the Adaptation Strategy of agriculture sector to climate change impacts includes a summary of the

future climate change projections and associated impacts on crops and water resources as well as an analysis of the proposed adaptation actions. A strategy for the efficient water use in agriculture is also included as an individual chapter of the adaptation strategy. For following up the results of the implementation of the adaptation strategy, a monitoring plan is part of adaptation strategy as well.

The adaptation strategy is consisted of nine (9) Chapters. Chapter 1, the introduction, includes also the methodology for the total impact assessment. In Chapter 2, the results of the exposure and vulnerability assessment are provided. In Chapter 3, the methodology used for climate change projections and the significant results for temperature and precipitation indices for Cyprus are presented. Assessment of future hydrological conditions related to agriculture is given in Chapter 4. Specifically, future water resources availability assessment approach is described, and then the significant results on future water availability in Cyprus pilot areas (Kiti, Xylofagou, Pegeia and Acheleia) are presented. Impacts per crop (wheat, barley, tomatoes, potatoes, olives and grapes) and vulnerability assessment are given in Chapter 5. In Chapter 6, the vulnerability maps (with and without adaptation) for each crop and scenario (RCP 4.5/ RCP 8.5/wet/dry/hot/cold) are provided. Chapter 7, presents the measures per crop, based on the prioritization of the MCA. Based on evaluation results, seventeen adaptation measures are suggested, which mainly address impacts related to decreasing plant health, drought stress or a combination of impacts. The recommended for implementation adaptation measures per crop, the implementation timeline and the potential funding sources are also presented. Chapter 8, refers to the Strategy for the efficient water use in the agricultural sector of Cyprus. This chapter also include suggestions for integrating the outcomes of ADAPT2CLIMA project to the River Basin Management Plans and the National Strategy on Adaptation to Climate Change. Finally, for following up the results of the implementation strategy and determining whether the established climate adaptation objectives have been achieved, a monitoring and evaluation plan is described in Chapter 9.

After its completion, draft Adaptation Strategy will be launched for public consultation in Cyprus at least for four (4) weeks, according to the provisions of Public Consultation Guide (scheduled 01/09/2019-29/09/2019). The response of the Department of Environment, Ministry of Agriculture, Rural Development and Environment (Competent Authority) on questions raised during the public consultation will be published 2 weeks after the end of the public consultation. The Department of Environment will review the final draft of Adaptation Strategy and advice the Minister of Agriculture, Rural Development and Environment whether to submit it to the Council of Ministers for adoption. The time required for a Ministerial decision is approximately 2 months. Therefore, it is expected that before the end of the ADAPT2CLIMA project the Adaptation Strategy will be fully adopted by Cyprus authorities and become a guide for the adaptation of agriculture to climate change impacts.