

# A “POSITIVE” AND INTEGRATED APPROACH TO ASSESS CLIMATE CHANGE ADAPTATIONS. A CASE STUDY IN AGRICULTURE

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Climate change is expected to severely affect freshwater availability across much of Europe by the end of the century, with greater repercussions on the most vulnerable areas of Southern Europe and the Mediterranean basin. Agriculture is here particularly sensitive to such conditions, which may affect both irrigation water supply and crop response. In the last decade Po valley experienced a few extremely dry years, with severe water crises in most of river basins and agriculture suffering from intense water deficits and massive decrease in production. Since resource abundance rather than scarcity was often the primary concern in the region, local water institutions remain scarcely inclined to change their consolidated practices. This policy inertia represents a major barrier for novel policies, particularly under the non-stationary conditions predicted for the near future. On the other hand, the close frequency of droughts, the growing water demands, the uncertainty about future hydrological regimes urge for more sustainable solutions and force regional authorities to undertake initiatives aimed at rationalizing and containing water consumption.

Accordingly, an economic-territorial analysis based on Positive Mathematical Programming (PMP) is here proposed to depict the relevant adaptations of agriculture in a large portion of the Po Valley (i.e. Adda River Basin). The model assumes that interventions to increase water use efficiency can mitigate climate change effects, and relevant results can be explicitly derived by seeking for production patterns that (i) either properly manage or contrast resource shortages compared to the current situation and (ii) maximize farmers' margins. The study at hand benefits from an integrated approach, based on prior climate and hydrological modelling to predict water availability and crop requirements in the near and far future. The present model combines such outputs with farm-level economic and structural data, as well as stakeholders' perceptions on plausible scenarios; this way it is adopted for the simulation of farmers' behaviour in response to each modified condition, and to assess the implications of adaptation strategies on farm incomes and economic viability of the territory.

Ultimately, though the use of PMP is not new for the Po Valley area, the integrated approach is particularly suited to support water administrations in facing challenges related to climate change and normative prescriptions (e.g. Water Framework Directive, Rural Development Policy). The focus on the choice of the selected area is once more important for the assessment of water scarcity problems, as the Basin also represents the reference unit identified by water regulations and policies for the analysis of their implications.

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