

Science for Environment Policy

How vulnerable to climate change is agriculture in the Black Sea region?

The impacts of climate change in the Black Sea region are likely to affect agriculture in Ukraine, Romania, Moldova, Hungary, Bulgaria and Turkey, new research suggests. The number of days of plant growth was reduced in these countries as a result of reduced precipitation, increased temperatures and low capacity for irrigation to supplement water needs. A strong legal framework is necessary to deal with conflicting future demands for water, say the researchers.

Climate change is expected to affect water supplies in the Black Sea region, with rising temperatures and reduced rain and snowfall potentially leading to water shortages. **Agriculture** accounts for most of this region's water consumption and will be particularly affected by such impacts.

This study, funded by the EU [enviroGRIDS](#)¹ project, assessed the vulnerability of agricultural water resources to climate change in the Black Sea catchment. The researchers used the Driver – Pressure – State – Impact – Response (DPSIR) framework to link the pressures, such as a reduction in rainfall, to potential actions that can be taken to mitigate the impacts. They combined this with a measure of vulnerability that takes into account the sensitivity of the agricultural system (e.g. plant types and resilience to stress) and its capacity to adapt.

The researchers based their assessment on three climate change scenarios: (i) an increase in daily temperature of 3°C; (ii) a decrease in daily precipitation of 30%; (iii) a combined temperature increase and precipitation decrease, of 3% and 30% respectively. All scenarios were relative to baseline conditions during 1996 to 2006. Data came from output of the Soil and Water Assessment Tool developed for the whole of the Black Sea catchment.

Based on the number of days that plants can grow in a year, which is affected by daily temperature and water availability, the researchers found that the temperature increase was beneficial for plant growth across the region, as the number of days too cold for growth fell. In contrast, less precipitation reduced the number of days of plant growth.

Combined temperature increases and precipitation decreases affected plant growth in different regions of the catchment differently. Where the impact of reduced precipitation outweighed the impact of temperature increases, the overall impact on plant growth was negative. Moreover, the capacity to adapt to these changes by using irrigation was generally reduced across the catchment area, compared with the baseline conditions. The researchers considered that irrigation would only be possible if there was sufficient water to ensure that withdrawals would not jeopardise aquatic ecosystems, which were to be given priority over irrigation.

Switzerland, Italy, Albania, Montenegro, Slovenia and Austria were most likely to benefit from climate change. These mountainous countries are likely to have more higher-temperature days and will also be least affected by a reduced irrigation potential (i.e. the number of days per year when sufficient water is available). Ukraine, Romania, Moldova, Hungary, Bulgaria and particularly Turkey are likely to be more vulnerable to the impacts of climate change, mainly as a result of more dry days and reduced irrigation potential.

Reduced water availability is likely to lead to higher demand for irrigated water, competing with the water needs of a healthy aquatic environment. To meet the challenges of managing shared water resources in the face of competing demand, the study's authors emphasise the need for a strong legal framework that covers the whole of the Black Sea catchment and focuses on the role played by irrigation in agriculture.



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