How is water used within the EU agricultural sector?
Study provides new analysis

Increased use of water in the EU (by all users), and climate-related risks associated with water shortage, are rising over time.
This study analyses water-use, specifically within the EU agricultural sector, by Member State and crop type — a useful reference source for policymakers and academics.

The last 50 years have seen global freshwater demand rise by 40% — due to population growth and the consequent rise in demand for food, alongside the hazards associated with climate change. Sustainable and resilient water management is of critical importance to the agricultural sector.

As the EU is one of the largest agricultural producers in the world, it is particularly affected by changes in water availability. Mediterranean countries experience higher temperatures and lower rainfall than the rest of the EU and, among them, Spain is the largest exporter of agricultural products to the rest of Europe. Andalusia, in southern Spain, experiences the greatest challenge in the country, due to high summer demand for its water from tourism and agriculture.

The EU’s Water Framework Directive (WFD)\(^1\) encourages changes to agricultural practices, to improve water quantity and quality in Europe. In 2023 a new regulation on requirements for water reuse in agricultural irrigation\(^2\) will come into force, to stimulate water reuse in the EU.

This study provides a comprehensive analysis of the water needed for the production of crops, as well as the drivers of recent changes in water use, to enable greater insight into the water resource challenges of the future. At present the World Resources Institute classifies five of the EU Member States (MSs) at high risk of water scarcity (Portugal, Spain, Italy, Belgium and Greece)\(^3\) whilst six others are at medium risk (Luxembourg, Bulgaria, Estonia, France, Germany and Denmark)\(^4,5\).
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The researchers quantified and analysed the three main drivers of change in water use — across four crop types — these being: final demand, agricultural-sector technology changes (as well as ‘supply-chain linkages’ — i.e. changes in (foreign and local) related industries’ production processes) and water input (the amount of water required per unit cost of produced crop (different for each crop), i.e. m³ per $1 (€0.85) of production). This type of research, known as structural decomposition analysis (SDA), enables identification of the drivers of change (i.e. water intensity effects); whereas virtual water-flow analysis only identifies which sectors are the largest users of water. This is the first study to apply SDA to agricultural water use across all of the EU MSs, using data from the recently released EXIOBASE 3 database, including supply-chain linkage information from sectors across the 27 EU MSs, between 1995 and 2010.

The study showed that the largest EU crop producers have increased water use during the study period, largely due to changes in supply-chain linkages. However, several Mediterranean countries (such as Greece and Italy) where water scarcity has been a longstanding problem, have decreased their water consumption by improving water intensity — for example, changing to a crop type that requires less water or using a more efficient irrigation system.

In contrast, Spain, Germany and the Netherlands have seen a large increase in their total water use, compared to changes in agricultural production. In Germany, there was more than 200% rise in water use, which the researchers suggest may be due to the severe drought the country experienced during the 15-year study period, and the decision to increase the use of sprinkler irrigation. Crop production increased in most MSs, apart from Romania which swapped from low-water intensity crops to oil seed — a high water-intensity crop. This resulted in an increase in Romania’s agricultural water use, but a decrease in agricultural production.

The researchers found that wheat was the most water-intensive European crop — with its production accounting for 52% of aggregate crop water. This percentage increased to between 45 and 55% in France, Denmark and the UK. Cereal production accounted for the second highest crop water. The study showed that the largest EU crop producers have increased water use during the study period, largely due to changes in supply-chain linkages. However, several Mediterranean countries (such as Greece and Italy) where water scarcity has been a longstanding problem, have decreased their water consumption by improving water intensity — for example, changing to a crop type that requires less water or using a more efficient irrigation system.

The researchers suggest that policymakers can use these crop-specific results to develop strategies for sustainable water use, tailored to the places where each crop is grown. They assert that the detailed level of analysis in the study identifies individual influencing factors beyond the usual global categories of technology change and demand factors. For example, Spain’s water-use rose by 110% during the study period — the analysis showed that this was due to an increase in demand from local population growth and a rise in local household income. As household wealth increases, so does consumption of hidden water sources, for example, purchase of more water-intensive food products such as beef; or water-intensive clothing, made from materials such as cotton.