Water scarcity: How stronger governance could reshape crop competitiveness in the EU

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Summary

Around one-fifth of total EU crop value is generated in irrigated systems located in water-scarce regions, mainly in Spain, Italy, Greece, and Portugal. With the EU Water Resilience Strategy (2025) signaling stronger policy attention on water scarcity, this production is increasingly exposed to transition risks linked to tighter governance of irrigation water. In this context, we examine how the potential implementation of tradable freshwater rights could affect crop competitiveness and EU markets, focusing on crop groups representing around 90% of total EU crop value.

- **Crop competitiveness:** Crops vary in their economic water productivity, ranging from roughly EUR 1 gross revenue per cubic meter of irrigation water for grains & oilseeds (G&O) and sugar beets, up to EUR 30 to EUR 60/m3 for certain berries and greenhouse vegetables. Permanent crops occupy an intermediate position, ranging from around EUR 2.5/m3 for olives (including olive oil) to EUR 7 to EUR 10/m3 for fresh fruit. If tradable water rights were introduced, crops with higher water productivity would gain competitiveness, as farmers could afford to pay more to keep – or even expand – access to irrigation water. Conversely, producers of crops with lower water productivity facing higher water costs would have to choose between improving water efficiency to raise economic water productivity, continuing to irrigate amid lower margins, or shifting production toward rain-fed or more efficient alternatives.

- **Crop market impacts:** Impacts are expected to vary markedly across sectors. G&O and sugar beets should face limited impacts, as global markets would likely buffer losses in irrigated production from water-scarce regions. Vegetables and berries are best positioned to maintain – or increase – irrigated production, thanks to their ability to pay higher water prices. Permanent crops fall in between. Fresh fruit and grapes would be relatively well protected by their higher economic water productivity, but citrus and olives would face stronger impacts due to their lower water productivity and high share of production in irrigated systems in water-scarce regions. Global and EU olive oil markets appear to be particularly vulnerable because production is concentrated in a handful of Mediterranean countries.

For food and agribusiness companies, stronger water governance would mainly threaten sourcing. There is no one-size-fits-all solution, as impacts and adaptation options vary across crops and regions. To safeguard future availability, costs, and supply continuity, companies should assess their exposure to water-scarce sourcing areas, determine whether and how suppliers can improve water efficiency, and identify where alternative sourcing may be needed.

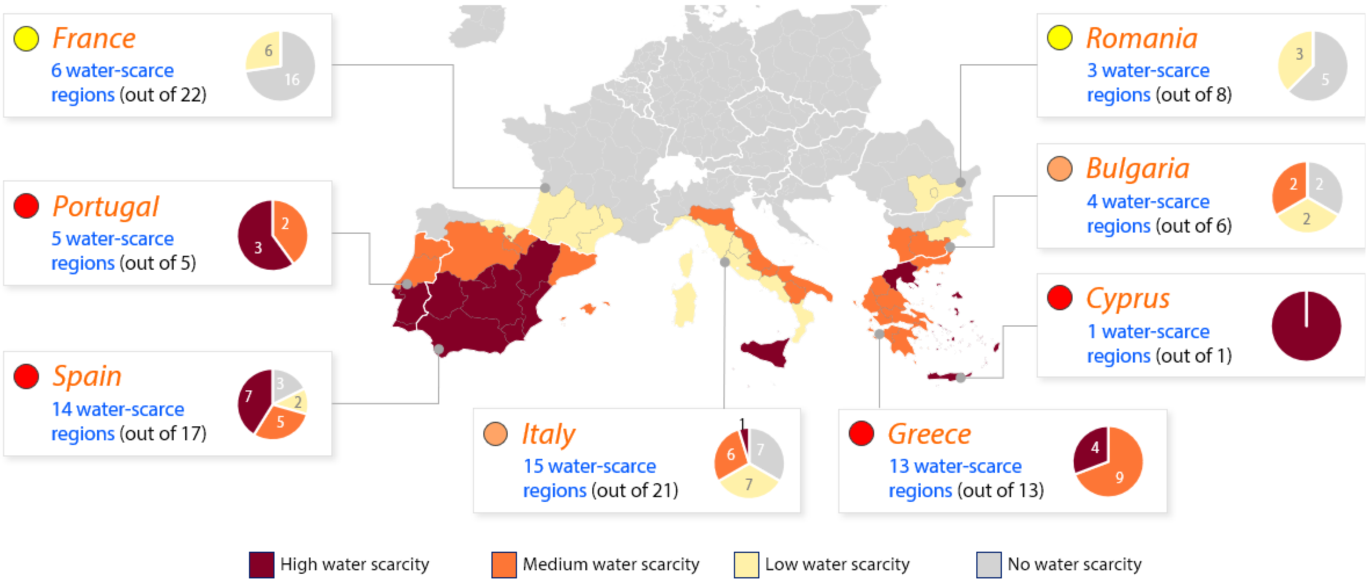
Water scarcity drives transition risks in EU crop farming

Agriculture is a major driver of freshwater use in the EU, accounting for one-third of total EU water abstraction and up to 70% in Mediterranean countries.[1] Around a quarter of the NUTS2 regions in the EU are chronically water scarce (see figure 1), meaning that freshwater demand from agriculture, households, and industry exceeds sustainable supply from rivers, lakes, and aquifers (see Appendix A for definitions and terminology). To maintain a sustainable ecological balance, these regions should reduce water demand and/or increase supply (e.g., via desalinization or water reuse).

As most agricultural water is used for irrigated crop farming, the sector is particularly exposed to **water-scarcity transition risks** linked to irrigation water becoming more tightly regulated. The recently published EU Water Resilience Strategy (2025) suggests that water scarcity is moving higher on the political agenda, driven by intensifying competition from non-agricultural water uses and climate change's projected impact on water supply. Building upon the Water Framework Directive, the strategy introduces nonbinding targets to reduce water consumption by 10% across all sectors (including agriculture) by 2030. If current efforts fall short, stricter measures, such as abstraction caps, higher water prices, or allocation schemes, may follow. Recent reductions in freshwater allocations in Spain's Murcia basin provide an early example of how tighter water governance can translate into irrigation shortages for farmers during periods of drought.

This publication analyzes water-scarcity exposure, economic water productivity, and the potential impact of stronger water governance on EU irrigated crop sectors. The analysis covers more than 30 crops across nine crop sectors, representing around 90% of total EU crop output value over the 2010-2023 period and uses Science Based Targets Network (SBTN) freshwater reduction targets to assess water-scarcity transition risks, which are already used by large food and agribusiness companies such as Arla Foods and General Mills (see Appendix B for details on the methodology).

Figure 1: Map of chronically water-scarce regions in the EU at the NUTS2 level



Note: Regions are classified based on the freshwater reduction target. High water scarcity refers to regions with a reduction target >50%, medium refers to 20%-50%, low to 5%-20%, and no water scarcity to <5%, where most regions have a 0% target, meaning they are not affected by chronic water scarcity. This analysis focuses on annual, structural water scarcity rather than seasonal water shortages and, therefore, some regions in western, northern, and parts of eastern Europe that may experience seasonal water constraints are not included. Furthermore, as there are no water-scarce regions in northern Europe, the map has been cropped to focus on areas of scarcity.
Source: RaboResearch (2026) based on Hogeboom et al. (2025) and publicly available information.

[1] AQUASTAT 2026

EU crop production is unevenly exposed to water scarcity

Around 21% of total EU crop production farmgate value is currently generated in irrigated systems located in water-constrained regions (see table 1). This production faces water scarcity-related transition risks due to significant Science Based Targets Network (SBTN) goals to reduce water use. Exposure varies significantly across member states.

- **Mediterranean core:** Crop farming in Spain, Italy, Greece, Portugal, and Cyprus is significantly exposed to water scarcity. On average, 50% of their national crop production value is generated in water-constrained regions, which together account for 19% of total EU crop production value.

- **Rest of the EU:** Outside the Mediterranean, the crop value generated in irrigated systems located in water-constrained regions is far more limited. France, Bulgaria, and Romania combined only represent 2% of total EU crop value, and only a small share of national crop production is exposed (see table 1).

Table 1: EU crop production exposed to water scarcity

Country	*Annual water-stress level based on SBTN targets*	*Irrigated crop value in water-scarce regions as a share of total EU crop value*	*Irrigated crop value in water-scarce regions as a share of total national crop value*
Spain	High	8.5%	56%
Italy	High	5.5%	32%
Greece	High	4.0%	58%
Portugal	High	1.2%	55%
France	Low	1.0%	5%
Bulgaria	Medium	0.1%	5%
Romania	Low	0.5%	5%
Cyprus	High	0.1%	86%
Total EU	**59 water-scarce regions out of 244 in total**	**21%**	

Notes: The 30+ selected crops are included in the figures of irrigated and total crop values.
Source: RaboResearch based on FAOSTAT, EUROSTAT 2026, Mialyk et al. (2024), and Zhu et al. (2025)

Crops vary in the value they generate per cubic meter of freshwater

Not only does water-scarcity exposure vary across the EU, it also varies across crops. To show how irrigated crops in the EU differ in terms of the value they generate per unit of irrigation water, we developed an economic water productivity (EWP) metric.

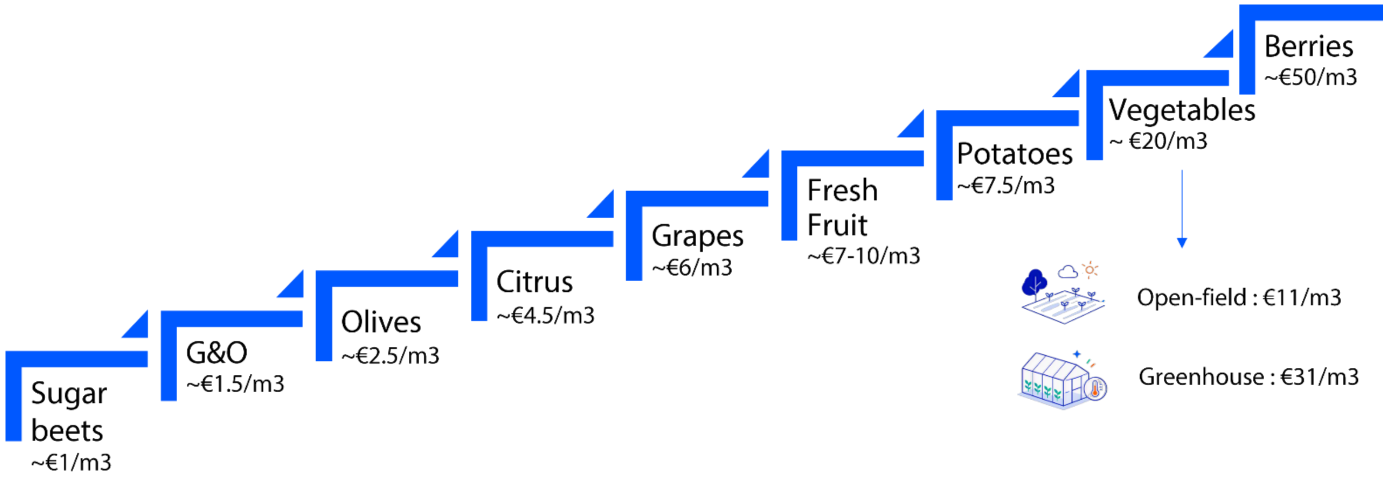
Our economic (fresh)water productivity metric reveals the gross farmgate revenue generated by a crop per cubic meter of irrigation water used in one year (EUR/m3 freshwater) in a given region. It reveals a clear hierarchy in how efficient different crops are in converting freshwater into economic value across the EU (see figure 2). While using economic margins rather than gross revenue would provide a clearer picture, margin data was not available.

- **Berries,** vegetables, and potatoes rank highest, with berries offering the highest return per cubic meter of freshwater (EUR 55 gross revenue/m3). Vegetables, where greenhouse production can be up to three times more water efficient than open field production, come next. Finally, potatoes produce around EUR 9.5/m3 on average.

- **Permanent crops sit in the middle,** with fresh fruits and grapes roughly generating 50% to 150% more value per cubic meter than citrus and olives.

- **Grains & oilseeds (G&O) and sugar beets are at the bottom,** generating only a bit more than EUR 1/m3 of water.

Figure 2: The freshwater ladder – High-EWP crops generate greater returns per cubic meter of irrigated water



Note: Values shown are production-weighted averages by crop sector. Economic water productivity for each sector is calculated as the average economic water productivity of the crops comprising that sector, weighted by their production value across all water-scarce regions. Values for open-field and greenhouse vegetable production represent the 10th and 90th percentiles, respectively.
Source: RaboResearch (2026) based on FAOSTAT (2026), EUROSTAT (2026), Mialyk et al. (2024), and Zhu et al. (2025)

Table 2 presents crops ranked from the most water-productive to the least. It also details their share of irrigated crop production value and of agricultural water use in chronically water-scarce regions. Crop groups at the top of the table generate relatively high economic value using comparatively small shares of irrigation water, whereas those at the bottom generate relatively lower value while accounting for larger shares of water use. For example, the vegetable sector uses 9% of total (agricultural) irrigation water used in water-scarce regions and generates 32% of the irrigated crop production value. Conversely, G&O crops account for 25% of irrigation water use but generate only 9% of total value.

Table 2: Production value and irrigation water use in water-constrained regions

Crop group	*Total EU crop production value in water-constrained regions (billion EUR)*	*Irrigated crop production value in water-constrained regions (billion EUR)*	*Value of irrigated production in water-constrained regions as a share of total irrigated production value (all crops)*	*Sector's share of total (agricultural) irrigation water use in water-constrained regions*
Berries	1.2	0.4	1%	<0.1%
Vegetables	13.3	9.7	32%	9%
Potatoes	1.7	0.9	2%	2%
Fresh fruit	6.6	3.3	11%	8%
Grapes (incl. wine)	14.9	6.0	20%	18%
Citrus fruit	3.6	2.6	8%	15%
Olives (incl. olive oil)	12.5	4.8	16%	21%
Grains & oilseeds	13.2	2.9	9%	25%
Sugar beets	0.2	0.2	1%	2%
Total	**67.3**	**30.6**	**100%**	**100%**

More competitive
Less competitive

Note: To help interpret the figures in the third column, the 1% reported for berries is calculated as EUR 0.4 billion (the value of irrigated berry production in water-constrained regions) divided by EUR 30.6 billion (the value of irrigated production across all crops in water-constrained regions). This represents the contribution of irrigated berry production to total irrigated agricultural production value in water-constrained regions.
Source: RaboResearch based on FAOSTAT (2026), EUROSTAT (2026), Mialyk et al. (2024), Zhu et al. (2025)

Water governance shapes crop competitiveness

When water is a limiting production factor, crops that generate more value per unit of freshwater tend to gain a competitive advantage. Whether this translates into actual production shifts, however, depends on how water is allocated – a political decision.

Irrigation water governance in the EU is currently fragmented. While the EU Water Framework Directive provides a common framework, member states have different rules, authorities, and allocation systems, with only a few examples of early-stage tradable water rights.[2] Water prices are often set below full cost, which may trigger overexploitation. With water cheaply available, irrigation of relatively water-inefficient crops, such as G&O, may continue despite structural scarcity.

By contrast, a market-based allocation system would strengthen competitive dynamics by assigning an economic value to water. It would make the opportunity costs of water explicit, thereby encouraging its allocation toward crops with a higher EWP. The Murray-Darling Basin in Australia provides an example of a more established market-based water allocation system. Under this scheme, limits are placed on how much water can be extracted from the different basins that make up the Murray-Darling river system. Farmers hold water entitlements that give them the right to access a share of available water within a specific basin. Each year, they receive water allocations that determine the actual volume of water they can use, based on local water availability and hydrological conditions, such as rainfall and reservoir storage levels. Farmers can trade unused allocations or purchase additional allocations from other farmers at market-determined prices.

As recent policy developments suggest that stronger water governance may emerge in the future, we explored what could happen to EU crop markets if a similar scheme were to be implemented. Under this scenario, farmers growing high-EWP crops, such as vegetables, could pay more for additional water allocations and possibly purchase these from producers of lower-EWP crops who may prefer to sell their water volumes. The latter, facing higher water costs, could choose between continuing irrigated production under lower margins and/or reduced water availability, or improving water efficiency practices to reduce water use while maintaining production. However, while public funding often supports investments in water-saving technologies such as drip irrigation, efficiency improvements are not always sufficient, and shifting to higher EWP crops may remain the only economically viable option in certain cases.

Economic water productivity is not the full story

The EWP metric indicates how efficiently crops convert irrigation water into farm revenue. However, its implications for competitiveness and production adjustment depend on additional factors.

- **Biophysical and socioeconomic constraints:** Historical specialization can also limit adjustment, as local value chains are often organized around established crops and production systems. For example, soil may be suitable for current crops and less suitable for alternatives. For perennial crops, adaptation is particularly challenging because orchards require long-term investments and years to reach full production. In some cases, such as olive groves on sloping or low-fertility land, alternatives may not be economically or agronomically viable.

- **Farm structure and adaptation capacity:** The ability to adapt varies across producers. Many Mediterranean regions are characterized by small family farms with limited financial, technical, and managerial resources. These constraints can limit farmers' ability to respond to water scarcity with investments in water-saving technologies, adoption of drought-tolerant varieties, absorption of transition costs, or management of the risks associated with changing production systems.

- **Market dynamics:** EWP reflects prevailing market prices. Changes in supply, demand, or quality can affect crop prices and, therefore, the output they produce per unit of water. For example, prices tend to rise when a crop's supply falls or quality improves, increasing the value generated per unit of water. These price signals can also make alternative crops more attractive over time.

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[2] European Commission (2024), p.29

- **Institutional and infrastructure conditions:** The impact of water scarcity depends on local governance, reduction targets, enforcement capacity, storage and distribution infrastructure, and incentives for adopting water-saving technologies. These factors influence both water availability and farmers' ability to adapt.

Stronger water governance could create market winners and losers

Economic water productivity shows which crops are better positioned to compete for scarce irrigation water. To assess potential market impacts, however, we also need to consider each crop sector's exposure to water scarcity risk. The latter is added by exploring the share of irrigated crop production value from water-scarce regions over total EU crop value (see table 3). Combining both indicators, we anticipate the following market impacts:

- **Limited market impacts for G&O and sugar beets,** as only a small share of these crops is produced in irrigated systems located in water-constrained regions (4% for sugar beets and 5% for G&O, most of which is corn). Moreover, being globally traded commodities, potential reductions in irrigated output would likely be offset by increased rain-fed production in major grain-producing countries such as France, Germany, and Poland, and/or by imports from outside the EU.

- **Strongest market pressures for citrus and olives (and olive oil),** as these crops combine low EWP with a large share of production generated in irrigated systems from water-constrained regions (71% and 38%, respectively). **Olive** markets stand out as particularly vulnerable, since around 95% of global production is concentrated in a few Mediterranean countries, with Spain, Italy, and Greece accounting for around 60%. This leaves limited scope for geographical substitution, making irrigated production shortfalls in the region – particularly in Spain, the global price setter – more likely to trigger price spikes across EU and global markets. **Citrus** production is the most exposed to water scarcity. However, a broader pool of exporting countries, including South Africa, Egypt, Morocco, and Argentina, makes substitution easier, thus buffering potential market impacts. For both olives and citrus, more efficient, high-density orchards could pay more for water, while higher water costs might pressure less efficient orchards out of (irrigated) production. Production adjustments are, however, constrained by long investment cycles, though public support may help improve the water productivity of otherwise uneconomic systems, as seen in Andalusia's olive sector.

- **Intermediate market pressures for fresh fruit and grapes (including wine),** as these crops combine significant exposure to water scarcity (28% and 22%, respectively) with relatively high EWP. As a result, producers would be able to invest and pay more for water to protect the yields, quality, and, ultimately, value of orchards and vineyards that took years to establish. Large and premium producers would be particularly well positioned to do so, while smaller and/or lower-value producers would face greater pressure, mirroring the dynamics observed in citrus and olives. Whether this could ultimately lead to greater market consolidation remains an open question.

- **Lowest market impact for vegetables,** which may even benefit from tradable water rights. Despite high exposure to water scarcity (44%), their significantly higher EWP would enable growers to outbid all other crop sectors for water. Consequently, irrigated output would likely be preserved – or even expanded in some regions – particularly for greenhouse production, where substantial fixed investments strengthen growers' willingness to secure water. The **berries** sector would likely follow similar dynamics, as its very high EWP might support production growth. However, the rise in absolute value generated would likely be modest due to its relatively small market size.

Table 3: Value of irrigated production in water-constrained regions over total EU crop value

Crop group	*Crop value from irrigated crops in water-constrained regions (billion EUR)*	*Total crop value in EU (irrigated and rainfed) (billion EU)*	*Irrigated production in water-constrained regions as a share of total EU production*
Berries	0.4	2.9	15%
Vegetables	9.7	22.0	44%
Potatoes	0.9	10.5	8%
Fresh fruit	3.3	11.6	28%
Grapes (incl. wine)	6.0	26.9	22%
Citrus Fruit	2.6	3.6	71%
Olives (incl. olive oil)	4.8	12.6	38%
Grains & oilseeds	2.9	53.8	5%
Sugar beets	0.2	3.6	4%
Total	**30.6**	**147.4**	**21%**

More competitive

Less competitive

Source: RaboResearch (2026), FAOSTAT (2026), EUROSTAT (2026), Mialyk et al. (2024), Zhu et al. (2025).

Companies should start assessing their exposure to water-scarcity risks

While increasing political attention to water scarcity in the EU suggests that stronger water governance may be on the horizon, companies and investors are becoming increasingly aware of water scarcity-related risks as well. For companies downstream in the food supply chain, this would mainly relate to their sourcing, as some markets (such as citrus and olives) are expected to face stronger impacts than others (e.g., vegetables and berries). To safeguard future availability, costs, and supply continuity, companies could already start assessing their exposure to water-scarce sourcing areas, evaluate suppliers' ability to improve water efficiency, and identify potential alternative sourcing options.

Appendix A: Definitions and terminology

Economic water productivity (EWP): A metric that tells the gross farmgate revenue generated by a crop per cubic meter of irrigation water used in one year (EUR/m3 freshwater) in a given region. It reveals a clear hierarchy in how efficient different crops are in converting freshwater into economic value.

Farmgate value: A measure of what farmers earn from crops at the point of sale before any processing or distribution. It is calculated as the price received by farmers multiplied by the quantity sold. In contrast, retail (or market) value uses the final price paid by consumers, which includes added costs and value from processing, transport, and retail.

Meteorological drought: A temporary period of below-average precipitation, often combined with high evapotranspiration, resulting in unusually dry conditions. Agricultural drought occurs when rainfall and soil moisture are insufficient to meet crop water requirements. Water scarcity and agricultural drought are closely linked: Water scarcity can amplify drought impacts on agriculture by limiting farmers' ability to buffer water deficits through irrigation, while drought can further reduce water availability and increase water demand, reinforcing underlying water scarcity.

NUTS2 regions: The EU's standard regional statistical units used for regional analysis, statistics, and policymaking.

Science Based Targets Network (SBTN): Founded in 2019 by a coalition of international NGOs and institutions (including WWF, World Resource Institute, UN Environmental Programme, and the World Economic Forum), SBTN develops science-based guidance for companies for setting targets on nature (freshwater, land, biodiversity, oceans). While the framework is still evolving and adoption is at a relatively early stage, it provides an emerging approach for environmental target-setting endorsed by over 40 global companies.

Sustainable freshwater supply: The amount of freshwater available for human use without causing long-term depletion or ecological degradation. Freshwater (also referred as "blue water") refers to water in rivers, lakes, and groundwater that can be abstracted for human use. It is different from seawater (not usable without desalination), "green water" (soil moisture derived from rainfall and used directly by plants), and "grey water" (water required to dilute pollutants to meet quality standards).

The Water Framework Directive (WFD): Established in 2000, the WFD is the main EU law for protecting and improving the status of Europe's waters, both in terms of water quality and quantity (or use). Its primary aim is to achieve "good status" for water bodies, which requires, among other things, regulating abstraction to maintain sufficient environmental flows. Progress has been slower than expected. According to the latest assessment, only 38% of EU surface water bodies achieved good ecological status, and many are still not expected to reach good status by the 2027 deadline.

Water scarcity: A chronic climate-related condition characterized by a long-term imbalance between water supply and demand, reducing the amount of water available for human use. In this report, water-scarce and water-constrained are used interchangeably to refer to regions where freshwater availability is structurally insufficient to meet demand sustainably. It differs from drought, which is an acute climate event that refers to a temporary period of below-average precipitation, often combined with high evapotranspiration, resulting in unusually dry conditions. The two phenomena are closely linked: Water scarcity can amplify drought impacts on agriculture by limiting farmers' ability to buffer water deficits through irrigation, while drought can further reduce water availability and increase water demand, reinforcing underlying water scarcity.

Appendix B: Methodology

This publication analyzes how water scarcity exposure varies across EU irrigated crop sectors, how efficiently different crops convert irrigation water into economic value, and how stronger water governance could reshape crop competitiveness and markets. The analysis focuses on 30+ crops grouped in nine crop sectors (see table) – representing around 90% of total EU crop output value over 2010-2023 – and uses the freshwater reduction targets developed by the SBTN to assess water-scarcity transition risks. These science-based targets specify the share of freshwater abstraction that should be reduced to restore sustainable levels in a basin, while explicitly accounting for the water needs of the environment (which is considered via the Environmental Flow Requirements, EFRs, which are defined as the minimum water flow needed to sustain rivers, wetlands, and other waterbodies along with the ecosystems depending on those). They are already being used by large food and agricultural companies, such as Arla Foods and General Mills, to assess their water scarcity-related risks. These targets are also consistent with the Aqueduct Water Risk, another widely used framework for assessing water-related risks.

To show how irrigated crops in the EU differ in terms of the value they generate per unit of irrigation water, we developed an economic water productivity (EWP) metric. EWP is calculated by dividing farmgate price (EUR/metric ton) by blue water footprint (m3 freshwater/metric ton). The metric is computed for each crop using national farmgate prices and NUTS2-specific blue water footprints, meaning the metric is location-specific at the NUTS2-level.

Finally, as the literature typically frames water scarcity in Europe around the Mediterranean basin, we categorized countries with significant exposure as the "Mediterranean core" and countries with more limited exposure as the "Rest of the EU" to align with common practice.

Crop group	
Berries	strawberries, blueberries, raspberries
Vegetables	cucumbers, peppers, tomatoes, lettuce, cabbages, cauliflowers, carrots, onions, pumpkins
Potatoes	
Fresh fruit	apricots, apples, peaches, pears, plums and sloes, melons, watermelons
Grapes	including dessert grapes and wine
Citrus fruit	lemons, limes, oranges, mandarins
Olives	including table olives and olive oil
Grains & oilseeds	corn, wheat, barley, sunflower, rapeseed, soybeans
Sugar beets	

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