

Agricultural virtual water trade of Turkiye

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Food security has become a global concern in recent years. More than 333 million people are already facing acute levels of food insecurity (World Food Programme, 2023). The fact that 70% of water on earth is withdrawn for agricultural use indicates that this sector is highly vulnerability to climate change (FAO, 2022).

The concepts of water footprint and virtual water trade have emerged as crucial tools to minimize the negative impacts of climate change in water-scarce regions and provide effective and sustainable water use. Water footprint is a tool to measure the total water used in the production process of a certain product. By exporting/importing these products, the embedded water content of the products is also traded, which refers to the concept of virtual water trade. It becomes advantageous especially for countries facing water scarcity, allowing them to import crops that require substantial water resources instead of cultivating them domestically, thereby preserving their limited water resources.

This study evaluates virtual water trade of Turkiye through its agricultural export, which is expected to be significantly impacted by the climate change. First, the products that are of great importance in exports were determined in terms of quantity (tons/year) and value (US\$/year) as given in Table 1 and Table 2 (UN Comtrade, 2023). Virtual water export was calculated by taking into account the global water footprint and export amounts of these products (Figure 1) (Mekonnen and Hoekstra, 2010).

Table 1. Top ten exported crops of Turkiye ranked by net weight

No	Crops	Net Weight (tons/year)	Trade Value (US\$/year)
1	Mandarins	1.227.508	620.124.313
2	Tomatoes	525.608	327.269.452
3	Maize	477.391	119.632.681
4	Lemons	473.263	290.426.975
5	Grapes	459.567	650.971.088
6	Oranges	340.133	158.024.727
7	Bananas	323.224	167.130.616
8	Lentils	315.554	270.853.933
9	Rice	246.186	137.044.055
10	Apples	179.262	67.450.169
	Total	4.567.696	2.808.928.009

Table 2. Top ten exported crops of Turkiye ranked by value

No	Crops	Trade value (US \$/year)	Net Weight (ton/year)
1	Hazelnuts	1.194.617.963	158.064
2	Grapes	650.971.088	459.567
3	Mandarin	620.124.313	1.227.508
4	Tobacco	367.933.749	50.181
5	Tomatoes	327.269.452	525.608
6	Apricots	323.159.795	140.823
7	Lemons	290.426.975	473.263
8	Figs	274.080.185	76.923
9	Lentils	270.853.933	315.554
10	Cotton	194.330.278	106.522
	Total	4.513.767.731	3.534.013

The virtual water of the most exported crops was found as 5.9 billion m³/year (Figure 1). This value is high enough to meet the domestic water needs of Istanbul city with population of 15.5 million for nearly 7 years. As the results show, the water footprint of maize is quite high, yet maize is one of the most exported products in terms of quantity with low economic contribution. In contrast, although products such as bananas, oranges, apples and tomatoes are exported in large quantities, the water footprint is low.

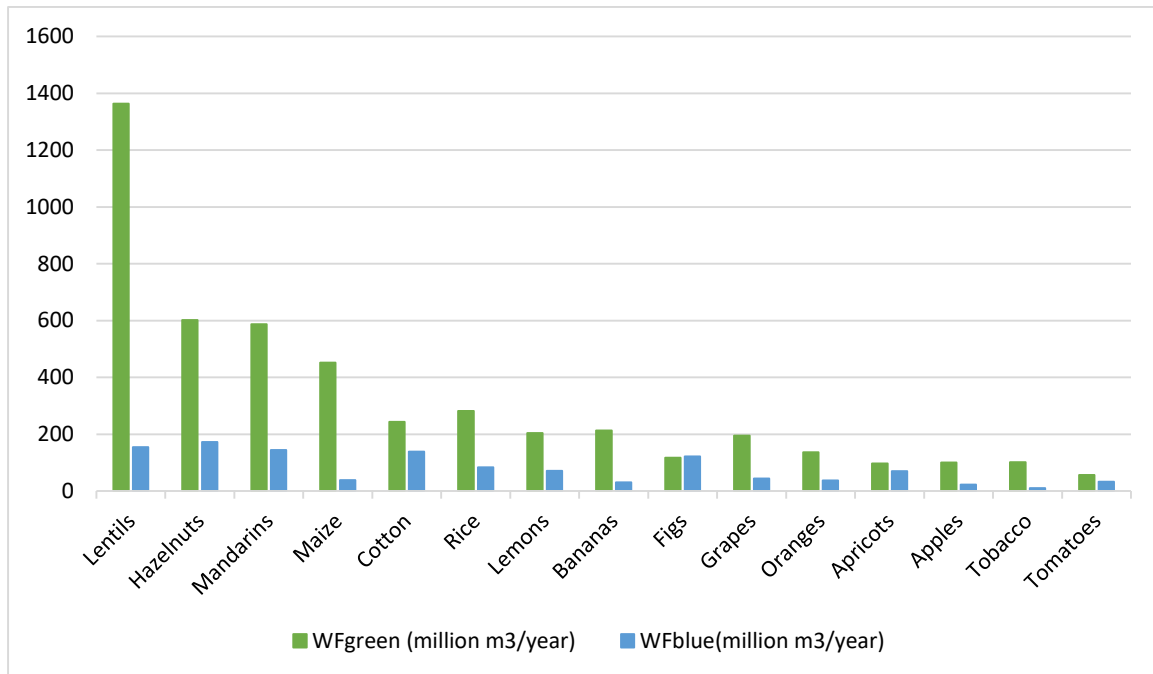


Figure 1. Virtual water export of Turkiye for the most traded crops

Based on the results, Turkiye can reduce the amount of virtual water trade by reducing maize and rice exports due to their high water footprints, substantial export volume, and low economic value. Similarly, the export of cotton and lentils, despite their economic returns, should be reduced owing to their high water footprint. Conversely, the export of crops such as apricots, tobacco, and tomatoes, characterized by low water footprint and high income, should be sustained. Simultaneously, there is a recommendation to increase exports of crops such as bananas, oranges, and apples, given their low WF, despite being exported in significant quantities. Optimizing virtual water trade of a country can help achieve sustainable water management.

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