

Water footprint of key-traded crops of Turkiye

T. Pilevneli¹, E. Ercin², G. Capar¹

¹Water Management Institute, Ankara University, Ankara, Kecioren, 06135, Turkiye

²R2Water Research and Consultancy, Amsterdam, the Netherlands

Keywords: water footprint, export, key-traded crops

Presenting author email: tpilevneli@ankara.edu.tr

This study presents part of CREATE project results, which investigates the cross-border climate vulnerability of Turkish, European and African food trade systems. Key-traded crops between Turkiye and Europe were identified as hazelnut, apricot, fig and grapes within the scope of this project. These crops are also exported to several countries outside of Europe and they are important for Turkish economy. On the other hand, production of these crops require large volumes of water that creates pressure on national water resources. Considering the negative impacts of climate change, it is beneficial to evaluate the water footprint (WF) of these key-traded crops.

The average annual production and exported amounts of key-traded crops are given in Table 1. Among them, fig and hazelnut have the highest export ratios of 64% and 61%, respectively. On the other hand, the highest amount of production and export belongs to grape and approximately half of apricots produced is exported.

Table 1. Average annual production and export of key-traded crops in Turkiye

Key-traded crop	Average production (10 ³ ton/year)	Average exported amount (10 ³ ton/year)	Export ratio (%)
Apricot	672.8	324.7	48
Grape	3,523.1	1,082.1	31
Fig	277.6	177.2	64
Hazelnut	603.0	365.8	61

Source: TURKSTAT, 2020. TUIK - Data Portal for Statistics

The top ten exported countries of each key-traded crop are given in Table 2. As seen, 65% to 80% of total annual exports are done to these ten countries. Russian Federation, Germany, France, and the Netherlands import all key-traded crops from Turkiye. For apricots, 21%, 14% and 9% of total exports is done to Russian Federation, Iraq and the USA, respectively. For grapes, 24%, 14% and 9% of total exports is done to Russian Federation, the UK and Germany, respectively. For figs, 18%, 12% and 10% of total exports is done to Germany, France and the USA, respectively. For hazelnuts, 32%, 15% and 10% of total exports is done to Italy, Germany and France, respectively.

Table 2. Average annual export amount of key-traded crops from Turkiye

Apricot		Grape		Fig		Hazelnut	
Exported to	Amount (10 ³ ton / year)	Exported to	Amount (10 ³ ton / year)	Exported to	Amount (10 ³ ton / year)	Exported to	Amount (10 ³ ton / year)
Russian Fed.	69.29	Russian Fed.	260.56	Germany	31.03	Italy	118.06
Iraq	44.43	UK	152.36	France	21.70	Germany	56.29
USA	27.97	Germany	97.26	USA	16.89	France	36.26
Germany	23.10	Netherlands	65.92	UK	9.26	Canada	18.09
France	15.91	Ukraine	56.99	Russian Fed.	8.00	Switzerland	18.08
UK	13.62	Italy	40.18	Netherlands	7.51	Poland	17.97
Australia	9.78	France	35.66	Italy	7.28	Brazil	7.19
Ukraine	9.04	Belarus	32.90	Switzerland	5.41	USA	7.16
Brazil	8.24	Australia	30.06	China	4.43	Netherlands	6.93
Netherlands	7.05	Saudi Arabia	23.44	Belarus	3.41	Russian Fed.	6.75
Other	96.3	Other	286.8	Other	62.3	Other	73.0

Source: UN Comtrade, 2013-2022 trade statistics

The WF of key-traded crops are given in Figure 1. The term “national” in Figure 1 refers to the sum of green and blue WF of key-traded crops that are produced and consumed in the country, and the term “export” refers to the sum of green and blue WF of key-traded crops that are produced in Turkiye and exported to other countries. The green and blue components of WF for the key-traded crops were taken from the WaterStat database (Mekonnen and Hoekstra, 2011).

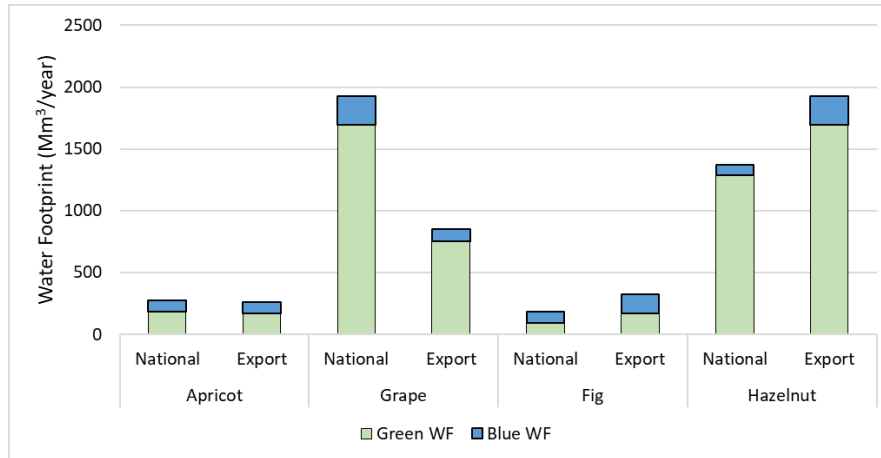


Figure 1. Water footprint of key-traded crops (national and exported)

As seen in Figure 1, grape production has the highest WF, with an annual WF of 2,782 Mm³. It is followed by hazelnut production (2,260 Mm³) and apricot production (538 Mm³). Fig production has the lowest WF with an annual value of 509 Mm³. When the blue WF component, which is an indicator of freshwater consumption (through irrigation), grape production has the highest WF with an annual consumption of 335 Mm³, followed by the production of fig (248 Mm³), apricot (182 Mm³), and hazelnut (136 Mm³). The total annual WF of key-traded crop production in Turkiye is equal to 6,088 Mm³, where 901 Mm³ is blue water component.

The annual virtual water exports of selected key-traded crops is equal to 48% of total WF. The exported virtual water content is equal to 2,809 Mm³, where 85% is green WF and 15% is blue WF. This is highly affected by high green water content and high production volumes of grapes and hazelnuts. In hazelnut production, approximately 94% is green WF content and account for 49% of virtual water exports. It is followed by grapes, where 88% is green WF content and account for 30% of virtual water exports. On the other hand, fig production has a green WF content of 51% and account for 12% of virtual water exports.

Climate change scenarios imply that average irrigation water availability in Turkiye could decrease by 40% to 48% between 2040-2100 for RCP 4.5 and RCP 8.5, respectively (Pilevneli et.al, 2023). Although hazelnut producing regions are on the safe side, fig, grape and apricots are mainly produced in regions that are under high risk of drought. Fig and grape are produced widely in Aegean region, where irrigation water deficiency up to 100% is expected. Under these circumstances, the export potential of these key-traded crops might decrease severely in the coming years.

References

1. UN Comtrade, 2023. URL: <https://comtradeplus.un.org/>
2. Mekonnen, M.M. and Hoekstra, A.Y. 2010. The green, blue and grey water footprint of crops and derived crop products, Value of Water Research Report Series No. 47, UNESCO-IHE, Delft, the Netherlands.
3. TURKSTAT, 2023. TUIK - Data Portal for Statistics. <https://data.tuik.gov.tr/Kategori/GetKategori?p=Tarim-111>
4. T. Pilevneli, G. Capar, C. S. Cerda, 2023. Investigation of climate change impacts on agricultural production in Turkey using volumetric water footprint approach, Sustainable Production and Consumption, 35, 605-623.

Acknowledgement

This abstract contains some of the results of the “Cross-Border Climate Vulnerabilities and Remote Impacts of Food Systems of the EU, Turkey and Africa: Trade, Climate Risk and Adaptation (CREATE)” project funded by the “H2020 ERANET Food Systems and Climate (FOSC) Program and TUBITAK via project no. 220N242.