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Virtual Water Trade between Iran and CIS

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Abstract

With decreasing per capita water, the scarcity of this vital resource has intensified and the world water misdistribution has worsened the water crisis. Therefore, the optimal management and allocation of water resources are become doubly important specially in the agriculture sector. In this framework, the present study has investigated the foreign trade of virtual water for the product groups of Iranian agriculture with the Commonwealth of Independent States (CIS) in 2018. For this purpose, using the partial equilibrium method, first the water requirement of plants are calculated and then, by processing the data of Iran's bilateral trade, the volume of virtual water embodied in Iran's trade flows and trade balance with the selected countries is measured and examined. The results of the present study show that Iran was net importers of virtual water in the trade of agricultural products with the CIS in 2018. On the other hand, the present study shows that 70.5 percent of virtual water of the agricultural export to the selected countries in 2018 was through the blue water, while in the same year, 81.3 percent of water embodied in the import from the region was related to the green water. This issue, in addition to indicating the improper use of water resources for the production and export of agricultural products in Iran, if continued, could lead to a reduction in national reserves of fresh water resources in Iran. According to the findings of the present study, it is suggested that special attention must be paid to the water needs and virtual water trade in the formulation of agricultural strategies and upstream policy documents. In addition to the promotion of water efficiency, it is also recommended that the necessary technical and economic considerations must be adopted in the optimal allocation of virtual water components.

Keywords: Virtual Water, Foreign Trade, Iran, CIS.

JEL Classification: Q01, Q17, Q25.

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1. Introduction

The global water shortages are not promising. If the current trend continues, it is expected that by 2030, the water demand will be 40% more than the available resources. In the meantime, Iran is facing serious problems due to its often hot and dry weather due to its special geographical location. Frequent droughts, along with excessive exploitation of surface and underground water resources through a large network of hydraulic infrastructure and deep wells, have brought the country's water situation to a critical level. In the last century, the rapid growth rate of the population has been the most important factor in the reduction of renewable water per capita in the country.

As a result of the alarming trend of water consumption in the world, special attentions have been paid to optimal water management and the concept of virtual water. This concept has been developed in international trade theories specially the Hechscher-Ohlin-Samuelson (HOS) model based which countries with relative abundance of water export water-intensive products to countries with relatively less water resources.

The main purpose of this paper is to estimate the virtual water content of bilateral agricultural trade of Iran and CIS in 2018. This study is important considering the vital importance of water as well as the growing importance of CIS as Iran's trading partners. It is worth saying that there were some concerns in choosing this region including the temporary agreement on the establishment of free trade area between Iran and the Eurasian Economic Union, the growing value of trade Iran with this region and using the potential of regional trade to manage the water resources specially with imminently entering Iran into the stage of water crisis.

2. Materials and Methods

There are several methods for calculating virtual water consumption which is the water hidden specially in the products and services, one of them is CROPWAT, which was developed by the Food and Agriculture Organization of the United Nations (FAO).

To calculate virtual water, first by adding up the net need of water irrigation and the losses caused by the irrigation efficiency of the plant, the gross need of water irrigation is calculated and then it is divided into the yield of the studied product. Also, to calculate virtual green water in a similar way, the net irrigation requirement of the plant is calculated through effective rain and then it is divided into the yield of the studied product. Obviously, the water requirement of the plant will be equal to the sum of the effective rain (green) and the net irrigation requirement (water). The ratio of water requirement of the plant to its performance is also virtual water (green and blue) of the plant. Obviously, each plant has its own evaporation and transpiration components (effective rainfall and net irrigation requirement) and by entering these components in the used software, the basic data for virtual water calculations in foreign trade is provided. The yield data of the studied products were prepared from the Agriculture Database of the Ministry of Jihad Keshavarzi of Iran.

3. Discussion

Based on the results, Iran's virtual water export to CIS is equal to 551.98 million cubic meters and Iran's virtual water import from this region is estimated at 3977.027 million cubic meters, which indicates Iran is a net importer of virtual water in the agricultural sector in 2018.

The estimations of this research show that 70.5% of Iran's virtual water export in agricultural products is through blue water and 81.3% of virtual water import is through green water, this indicates the excessive use of water resources for the production and export of agricultural products in Iran, which can be due to the lack of land-use planning in the agricultural sector and the lack of an optimal cultivation pattern based on climatic conditions for the use of green water and the principle of water consumption productivity.

The findings indicate Iran imports green virtual water from Russia, Kazakhstan, Ukraine and exports blue virtual water to Russia, Kazakhstan and Azerbaijan. The largest exports of virtual water in 2018 were made to the countries of Russia (208.41), Kazakhstan (189.34) and Azerbaijan (41.10) (million cubic meters) and in the same year, the largest imports of virtual water were also from the countries of Russia (2836.73), Kazakhstan (725.60) and Ukraine (141.60) (million cubic meters). Iran is not in a state of virtual water trade balance with Moldova and Belarus, because it only exports virtual water to these countries, but does not import virtual water from them, and one of the reasons can be the distance. The importance of distance in relation to Iran and Russia trade can also be seen.

In brief, findings of this research show that on one hand Iran was net importers of virtual water in the trade of agricultural products with the CIS and on the other hand, net exporter in the blue water and net importer in the green water, all indicating inefficiency in water use management in Iran.

4. Conclusion

The results of this research show that in 2018, Iran was the net importer of virtual water and the net import of virtual water of Iran. According to the calculations of this paper, Iran has imported green virtual water and exported blue virtual water in agricultural products trade with CIS. Specifically, on average, the share of green Water in Iran's virtual water import is estimated at 81.28%, while the share of this water in Iran's virtual water export is only 29.62%. Therefore, in the export of agricultural products to the CIS, considerable pressure is placed on the surface and underground water resources, and the results of the present research show that Iran exports its underground and surface water resources in the trade of agricultural products with the CIS, and on the other hand, mainly imports rainwater.

Based on this research, it is recommended that while reviewing the structure of agricultural goods production, the issue of virtual water should be taken into consideration so that instead of using blue water resources, green water should be employed in the production and export of agricultural products. Reduced performance,

improper irrigation management, the number and volume of irrigation more than the plant needs, and the date and inappropriate time of irrigation are among the most important factors of water virtual blue water consumption. In agricultural products trade policies, products with high water demand which cannot be produced in Iran due to limited water resources, should be imported from countries with abundant water resources, and products that are highly resistant to drought should be produced domestically.

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