

Virtual Water: The Exploitation of the Elixir of Life Thru the Invisible Treasure Trade

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Abstract

Virtual water is the volume of water that is used in the production process of a commodity (Allan, 2003). Agricultural trade is by far the largest vehicle to move water virtually around the world. The effects of water scarcity in many countries and regions can be reduced through open farm trade and specialization. Many world countries are now suffering water shortages and expect worsening conditions in the future due to climate change, economic development and food demand increases¹. Therefore, this paper analyses about the most exporting water-intensive agricultural product and its virtual water content in the same using secondary data from various government data sources not only to find the virtual water content and also for the inhibition of the elixir of life. Hargreaves-Samani Method has been used for calculating the value of evapotranspiration and Allan, Hoekstra formula for finding virtual water value.

Keywords: Virtual Water, Inhibition, Elixir of Life.

Introduction

Water; a colourless, transparent, odourless liquid which forms the oceans, ponds, waterways and rain and is the foundation of the waters of alive organisms. Three fourth of our earth has covered by water. It made our earth extremely stunning. As Indian Nobel laureate, C.V. Raman has given the name for water "The Elixir of Life", it clearly defines the status and necessity of water for all living beings. Especially, for irrigation resolutions, agricultural activities, drinking purposes and so on. Water is very essential but now-a-days no one knew the indispensability of water. It is one among the five elements of life on earth which supports to the survival of all the living creatures. In ancient period people managed large tanks and reservoirs properly though they have got it as a free good. At present, water is a scarce resource to the whole world due to its negligence. The major reason for the scarce is because of the trade activities. Through exporting agricultural commodities (water-intensive goods) the trading nations have also exported its huge quantity of water for free to other nations.

The invisible water inside those commodities is labelled as "Virtual Water". Virtual water is the volume of water that is used in the production process of a commodity (Allan, 2003). This ideology was first propounded by Tony Allan J.A. Further, he stated that virtual water was an "Economically invisible and politically silent" aspect. This perception developed in the 1990s and receives more and more consideration from people who were anxious about water management.

1 Alberto Garrido, Paula Novo, Roberto Rodríguez-Casado & Consuelo Varela-Ortega, Economic aspects of virtual water trade: Lessons from the Spanish case, Technical University of Madrid, Spain

Even though there is a massive break is prevailing among the nations about this concern. Water is the most indispensable resource offered to us by the nature, but due to our ignorance about this elixir we were dragged from the place of peace to war. Prior to the economic liberalisation, India was a closed economy, now it's an open economy and the growth has been increased drastically through trade participation and activities. All over the world, 9 countries were facing really scary water shortages, on that India ranks 3rd. The clever setting is to think about how water can either contribute to harmony and constancy or on the other hand, help threaten helpless countries and regions around the world. It has been proclaimed that the wars and conflicts of the next century will be for water. Consider the following quotations, "Many of the wars of this country were about oil, but wars of the next century will be about water" (Serageldin in Cooper 1995:1115). This trade not only involves the exchange of goods and services but also the exchange of the resources of the exporting nation. Through exports, nations not only exchange the consumable goods but also the water that is used to the production of the same. That invisible water is what we called as the 'Virtual Water'.

Objectives

1. To explore the most exporting Indian agriculture product to the neighbouring nations.
2. To estimate the level of virtual water content in the exporting product need to be sighted.

Methods and Materials

This study is based on secondary data which has been collected from different sources like Directorate General of Commercial Intelligence and Statistics (DGCIS), Open Government Data, Department of Commerce and already processed data is used from Craswell, E's work "Integrated Assessment of Water Resources and Global Change: A North-South

Analysis". India is the largest exporter of agricultural products as well as the virtual water thru trade, hence the top traded commodity, i.e., Basmati Rice product alone taken under consideration for the analysis. And from the top three Basmati rice producer states (West Bengal, Uttar Pradesh and Punjab) West Bengal is taken.

The Virtual Water Value is then defined as the quantity of water evapotranspired at field level (ET_o) to the yield (increment or total yield). It is expressed in m³ of water kg of crop.

$$\text{Therefore, Virtual Water Value} = \frac{ET_o (m^3)}{\text{Yield (kg)}}$$

For finding the value of evapotranspiration, Hargreaves- Samani Method has been used.

$$ET_o = 0.0135 K_r (T+17.78) \times (T_{max} - T_{min}) 0.5 R_a$$

Where,

T = temperature (oC).

R_a = is the extra-terrestrial radiation in mm/day which can be obtained from published tables or be calculated (Allen et al. 1998).

KT = land mass; value ranges from 0.162 and 0.190 for coastal regions.

T_{max} – T_{min} = Maximum Temperature – Minimum Temperature.

Results and Discussion

India's economy has enhanced mostly due to improved overseas trade. Hence, trade helps to increase the growth of the economy as well as the depletion of their own resources. Through this action, the arid regions of the world also enjoy same as the semi-arid nations. The water is traded mostly through the agricultural products. Following China and United states of America, India plays a leader role in the export of agricultural goods.

The following table describes about the most rice producing states of India in rank order.

Table 1 Rank order of Top 10 Rice Producing States in India (in million tonnes)

S.No	Rank	State	Rice Production in Million Tonnes	Area Under Rice Cultivation in Million Hectares
1	I	West Bengal	15.75	5.46
2	II	Uttar Pradesh	12.5	5.86
3	III	Punjab	11.82	2.97
4	IV	Tamil Nadu	7.98	2.04
5	V	Andhra Pradesh	7.49	2.16
6	VI	Bihar	6.5	3.21
7	VII	Chhattisgarh	6.09	3.82
8	VIII	Odisha	5.87	3.94
9	IX	Assam	5.14	2.46
10	X	Haryana	4.14	1.35

Source: Ministry of Statistics and Programme Implementation

West Bengal is the major rice producing state in India. Nearly semi of its arable land is under rice farming. In the fiscal year 2016, the state produced about 15.75 million tonnes of rice over 5.46-million-hectare cultivable area².

2 Retrieved from the website: <https://www.indiatoday.in/education-today/gk-current-affairs/story/top-10-rice-producing-states-in-india-rice-production-and-area-under-cultivation-1343024-2018-09-18>

The following table represents about the export of Basmati and Non-Basmati rice in million tonnes to neighbouring nations.

[fairs/story/top-10-rice-producing-states-in-india-rice-production-and-area-under-cultivation-1343024-2018-09-18](https://www.indiatoday.in/education-today/gk-current-affairs/story/top-10-rice-producing-states-in-india-rice-production-and-area-under-cultivation-1343024-2018-09-18)

Table 2 India's Trade flow for Basmati Rice (2009-17)

Year	Basmati export (million tonnes)	Non-basmati export (million tonnes)
2009-10	2.02	0.14
2010-11	2.37	0.1
2011-12	3.18	4
2012-13	3.5	6.64
2013-14	3.76	7
2014-15	3.7	8.23
2015-16	4.04	6.37
2016-17	3.25	5.21

Source: Department of Commerce

The table shows that, as years pass, the import is in an increasing trend in arid regions of the world. India is a chief exporter of Basmati rice to the globe. In FY 2016-17, India exported 400,480 MT of Basmati rice worth Rs 21,605 crores. Saudi Arabia, UAE, Iran, Iraq and Kuwait have been the major importers of Indian Basmati rice that accounts to nearly 45%.

³The export of basmati rice is only possible after the

production process, as per this statement, the major factor that contributes to the production process is water.

That water has been further classified into three major categories, green, blue and grey. And the invisible water content in the product is virtual in nature and it has been calculated for the rice products by Craswell, E.; Bonnell, et al and shown

in his book entitled, (2007) Integrated Assessment of Water Resources and Global Change: A North-South Analysis.

The following table shows the average virtual water content of rice product for top three rice exporting countries (m³/ton):

Table 3 Virtual water content in the Rice product for the top three rice exporting nations

Product	USA	China	India
Rice (paddy)	1,275	1,321	2,850
Rice (husked)	1,656	1,716	3,702
Rice (broken)	1,903	1,972	4,254

Source: Secondary Data Source

From the above table, it is clear that the invisible water (virtual water) present in the agriculture product is high in nature. i.e., in Indian broken rice, the water present is as high as 4,254 liters.

Analysis and Interpretation

West Bengal’s normal and warmest monthly weather is retrieved from Weather and Statistics Department of Kolkata to estimate the T (temperature) value.

$ET_o = 0.0135 K_T (T+17.78) \times (T_{max} - T_{min}) 0.5 R_a$ $R_a = 0.75$ (in normal days); 0.25 (in cloudy days) ⁴	$K_T = 0.162,$
$ET_o = 0.0135^*$ $((31.675-2.9333333) + 17.78) * (0.75/0.25)$	$ET_o = 0.912128 \text{ m}^3$

Table List of Top Rice Producing States of India And Its Virtual Water Value

The following table describes about the Virtual water content in the Rice product.

State	Rice Production in million tonnes	Production (In Kgs)	Et _o Yield	Virtual water (in m3)	Virtual water (in liters)
West Bengal	15.75	15750	0.057913	57.91286	57912.86
Uttar Pradesh	12.5	12500	0.07297	72.97024	72970.24
Punjab	11.82	11820	0.077168	77.16819	77168.19
Tamil Nadu	7.98	7980	0.114302	114.3018	114301.8
Andhra Pradesh	7.49	7490	0.121779	121.7794	121779.4
Bihar	6.5	6500	0.140327	140.3274	140327.4
Chhattisgarh	6.09	6090	0.149775	149.7747	149774.7
Odisha	5.87	5870	0.155388	155.3881	155388.1
Assam	5.14	5140	0.177457	177.4568	177456.8
Haryana	4.14	4140	0.220321	220.3208	220320.8

Conclusion

Aldaya, Allan and Hoekstra (2010) assessed the strategic essentiality of green water with respect to commodities of global trade. Staple food crops have been selected for study which is of low economic value in the international market but needs large amount of water after rice. USA, Canada and Argentina were chosen as the major exporting countries for the studies which account 58% of wheat, 69% of maize and 63% of soybean to the

international export. The estimation of green VWC and blue VWC has been done region wise and their national averages have been estimated on the basis of the respective share of each state or provinces.

Maize is the most water intensive crop grown in Argentina, soybean in Canada and Wheat in USA. Generally, blue water has higher opportunity cost than green water. The results indicated that green water is more dominant in all countries as compared to blue water and ratio is more than one. It was found

that out of 37 nation 22 % accounts for maize, 55% for wheat and 90% for soybean imports reflecting exporting countries are less diverse as compared to importing countries. Japan, China, Korea, Egypt, Netherlands, Spain and Mexico are among the top ten major importing countries. Study showed that global trade of maize, soya beans and wheat rely on green water.

Most of the importers have to depend on the resources of blue water and exporters have to depend on green water. Thus, this description shows that VWT can decrease the water demand for irrigation and play a vital role in securing water resources and food security related to water in the water-scarce nations. According to Allan and Hoekstra, virtual water trade is an essential factor which helps the arid and water-scarce regions to get benefited. But India is a semi-arid water scarce region and if the Indian nation continues trade without implementing any regulation on the water-intensive goods, then it will suffer more due to water scarcity.

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