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Fresh perspectives

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African air-freight of fresh produce: is transport of 'virtual' water causing drought?

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Every year the UK uses 189 million cubic metres of African water 'virtually', as a result of the import of green beans produced there. Formal planning for water use at a local and national level is beneficial, but the current international trade of fresh fruit and vegetables (FFVs) does not internalise wider environmental costs. Global environmental implications of water use (and trade) cannot be resolved without a larger and more comprehensive study.

What is virtual water?

Globally, 70 per cent of all freshwater is used in agriculture, arguably making water the most critical component of food production. Despite this, discussions on critical water issues have been noticeably absent from the food and trade debate. The withdrawal of groundwater at rates greater than nature's ability to renew it is widely documented in many parts of the Middle East, India, Mexico, China, the former Soviet Union and the United States. Moreover, 60 per cent of the world's accessible freshwater supply is found in just nine countries, illustrating water's uneven distribution across the globe. This hidden (virtual) trade of water can be seen in large grain imports into the Middle East and North Africa region, which increases water scarcity. Since 1972 the region has withdrawn more water from its rivers and aquifers every year than is being replenished. Virtual water constitutes the total volume of water involved in the sustainable production of the crop. Virtual water studies have highlighted benefits of food security for regions such as Southern Africa, as well as food trade in Japan. The relative comparative advantages of countries have been used to explain why virtual water trade takes place. However not 'accounting' for this movement of virtual water, whilst potentially beneficial in traditional economic trade terms, could lead to longer term sustainability issues – a type of environmental subsidy.

Different types of water

The global volume of freshwater is estimated to be 39 million cubic kilometres and exists in two distinct but constantly interchanging states: blue and green water. Blue water is the water found in rivers, lakes, reservoirs, ponds and aquifers. It therefore accounts for all water used in irrigation. Green water is essentially rainfall and also the return flow of water to the atmosphere as evapo-transpiration from water bodies such as lakes and ponds. Two-thirds of water in the hydrological cycle is green water. Agricultural production uses combinations of blue and green water content for crop production. The 'evaporative' (or productive) content is the amount of water that has transpired through crop growth. Any additional water applied to the crop but not transpired is considered 'non-evaporative' or irrigation loss. The evaporative virtual water

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Working with the whole supply chain to explore opportunities for securing, upgrading and expanding pro-poor procurement in international horticultural supply chains from developing countries

key messages

- **Globally, 70 per cent of all freshwater is used in agriculture.**
- **The UK uses 189 million cubic metres of African water annually for green bean consumption.**
- **A single Kenyan rose uses 2.7 litres of evaporated 'blue' water and pollutes a further 1.3 litres of local water resources.**
- **Since 1972 the Middle East and North Africa has withdrawn more water from rivers and aquifers than is being replenished.**
- **60 per cent of the world's accessible freshwater supply is found in nine countries.**

iied International Institute for Environment and Development

DFID Department for International Development

Natural Resources Institute

Fresh Perspectives is a series of short opinion and briefing papers written by key stakeholders on issues central to the debate about the impact of private voluntary standards and sustainable development. Fresh Perspectives fast-track the reader on specific issues and aim to guide the debate. Fresh Perspectives are freely available at www.agrifoodstandards.net and as paper copies on request from IIED. Fresh Perspectives operates an open-door policy for stakeholders with an opinion or an issue they wish to highlight. Contact James MacGregor at IIED if you are interested in writing one.

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>> continued content (EVWC) is the sum of blue and green evaporative water per tonne of crop, and is the definition of 'virtual water' in this report.

In addition, there are other factors that contribute to the total use of water per tonne of exported crop. First the non-evaporative water (irrigation loss etc) varies significantly depending on climate and crop production methods e.g. the use of drip-feed irrigation is far less wasteful than field flooding. Second, for a theoretically sustainable crop cycle any pollutants, such as pesticides, added to the crop need to be accounted for in the total water calculation. This is done by taking the volume of water required to dilute the pollutants to manageable levels (the pollution effect).

Virtual Water: Kenyan cut flowers and green beans

Taking Kenya as an example, the import of cut flowers to the UK results in evaporating 1,300,000 m^3 of water resources. This results in the pollution of 600,000 m^3 of Kenyan blue water resources and an inefficient use of irrigation water supplies equal to the volume of 2,200,000 m^3. For green beans 72,000,000 m^3 of evaporative water resources are used, plus an additional 35,000,000 m^3 in irrigation losses.

Impact on livelihoods

Emotive press accounts have highlighted the issue of 'irresponsible' water use from sites such as Lake Naivasha in Kenya. When consumers buy a Kenyan rose, do they consider the 2.7 litres of blue water that was evaporated or the 1.3 litres of water that was polluted in Kenya for its production? Does the price of a particular rose stem represent its impact on the water resources in the place where it was grown? Can the existing market bring the demand and supply to an equilibrium at which the price truly reflects the opportunity cost of the use of water resources for a particular rose stem? From a social and economic view, horticulture and floriculture exports from emerging markets such as Zambia and Kenya have been praised as positive moves toward cash crop production. However from an environmental perspective, the depletion of water levels and deterioration of water quality in places like Lake Naivasha are blamed on this. The concept of virtual water could be an important tool in the food-trade debate. Indeed the physical use of precious water resource, combined with virtual water trade, is an important consideration in the context of sustainable African livelihoods and the aim of achieving the Millennium Development Goals.

How can the government help exporting countries to monitor their water usage and make trade more efficient and sustainable for the long term?

- Differentiate the blue and green inputs into crops.
- Build capacity for green water to be utilised better or better captured for crop growth.
- Promote more benign irrigation practices and help increase irrigation efficiencies.
- Reduce chemical applications that have the potential to leach into the surrounding freshwater systems.
- Place an upper limit on basin extraction and share equitably and transparently.
- Launch educational campaigns encouraging an understanding of the real value of water to all basin inhabitants.
- Provide baseline information to poorly-understood production sites.
- Establish the real state of water resources in export countries to feed directly into development plans. A clearer understanding of the opportunity costs of water needs to be developed.
- Establish future water scenarios for countries affected by climate change and population increase, which include water exports and imports through trade.
- Feed development gains (taxes) back into water infrastructure projects.

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This publication is summarised from Fresh Insights no. 3 'Virtual water trade: A case study of green beans and flowers from Africa' by Stuart Orr (WWF-UK) and Ashok Chapagain, and is available on the project website www.agrifoodstandards.net

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