Agriculture and Human Values (2008) 25:257–270
DOI 10.1007/s10460-007-9096-7
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Virtual water: Virtuous impact? The unsteady state of virtual water

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Accepted in revised form June 28, 2007

Abstract. "Virtual water," water needed for crop production, is now being mainstreamed in the water policy world. Relying on virtual water in the form of food imports is increasingly recommended as good policy for water-scarce areas. Virtual water globalizes discussions on water scarcity, ecological sustainability, food security and consumption. Presently the concept is creating much noise in the water and food policy world, which contributes to its politicization. We will argue that the virtual water debate is also a "real water" and food and agricultural policy debate and hence has political effects. Decisions about food strategies and resource allocation play out on the national political economy, benefiting some while harming others. Therefore, a policy choice for virtual water is not politically neutral. "Real water" interventions are, likewise, inspired by economic as well as political considerations like control of the countryside, geopolitical strategy, and food sovereignty (independence from international political conditionality and market uncertainties). To illustrate these ideas, we look into case studies of Egypt and the State of Punjab in India. In India, a debate on the merits and demerits of a virtual water strategy is now emerging. In Egypt, which switched to food imports in the early 1970s, a long-standing taboo on debating virtual water is now being relaxed.

Key words: Agricultural policy, Food production, Food security, Food trade, Hydro-politics, Virtual water, Water scarcity

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Introduction

"Virtual water" is rapidly becoming a key concept in scientific and policy debates about regional, national and global water scarcity (Kumar and Singh, 2005).[1] Virtual water, "the water required to produce water-intensive commodities such as grain" (Allan, 2002), links the challenge of water scarcity to global, regional and local trade flows. The concept has started on a remarkable march through academic institutions, development agencies, agricultural research and planning institutions, and development policy institutions (Rosegrant et al., 2002; World Water Council, 2004; UNESCO, 2006). The basic idea is economic: the lions' share of exploited global water resources – up to 90% – goes to food production, leaving 10% for drinking and other uses (Allan, 1998). Resulting water scarcity problems can be solved and economic efficiency of water use increased by adapting global and regional food trade to spatial variations in water scarcity. In this view a net water-saving effect can be reached by concentrating production of water-intensive food crops and products with low water productivity in water-abundant countries while turning water-scarce countries into food importers and producers of less water-intensive crops. While agricultural production in the former tends to be based on rain-fed agriculture, in the latter it requires complex interventions in the "real" water cycle (irrigation systems, dams,

groundwater extraction) that often contribute to depletion of scarce water resources and ecological degradation (Chapagain et al., 2005; UNESCO, 2006; Wichelns, 2001).[2]

According to some virtual water analysts, countries or regions with a water deficit can increase national food security by importing water-intensive food. The virtual water discussion focuses primarily on water-deficient countries in the Middle East and North Africa (MENA region), where several countries have experienced temporary deficits since the 1950s and demand started exceeding supply in the early 1970s. Egypt usually serves as an example of a country that, consciously if quietly, avoids hydro-political crisis by its strategy of virtual water import, according to Allan, who coined the concept (Allan, 1997; 1998; 2002). Stressing that "more water flows into the MENA region annually as virtual water than flows down the Nile into Egypt," Allan has called virtual water "the dream solution in water-stressed economies" (Allan, 2002: 29). First, virtual water is cheap thanks to subsidized foodgrains and trade below production costs. Second, virtual water is politically "silent" and "therefore not politically controversial" (Allan, 1998: 545). With this solution at hand, why should countries look for hydraulic solutions or risk "water wars"?

Bringing together issues related to food production, consumption and trade,[3] the virtual water metaphor has stimulated scientific efforts to estimate and map virtual water flows between (and within) nations and regions in the world. This has yielded the water accounts and "footprints" (Hoekstra, 2003) that are prominently present in the virtual water literature. But the debate is more than just an abstract academic exercise. It has entered the policy domain, where "solutions" for water scarcity are produced and environmental conservation and food strategies based on it are increasingly recommended as good policy for water-scarce areas (Warner and Johnson, 2007; Wichelns, 2004). Hoekstra and Hung, for instance, stress that the next step is "to go beyond 'explanation' and to study how governments can deliberately interfere in the current national virtual water trade balances in order to achieve higher global water use efficiency" (Hoekstra and Hung, 2003: 46). In a nutshell, the concept's main practical ambitions are, first, to solve water scarcity problems at various scales and levels of governance by making optimal use of comparative advantage and differences in resource availability; second, to prevent water conflicts in a "politically silent" manner (Hoekstra, 2003; see Allan, 1998).

In view of the concern over climate change, virtual water is set to rise on the international political agenda as a smart solution to future challenges. In its transformation from analytical concept to policy prescription, we will argue, the concept becomes more explicitly normative in its content and real-life consequences, and therewith more problematic. As the concept becomes "policy" and data are mobilized for legitimizing certain courses of action in food production and resources governance, we enter the field of politics. Implementing virtual water policy entails conscious social and political choices based on specific problem perceptions and definitions, and conceptualizations of solutions. We must, therefore, liberate the virtual water debate from its focus on water accounting and macroeconomics and explore possible contributions to the debate by political science and other disciplinary fields. Is virtual water as inherently "politically silent" as Allan suggests? Is its intentional "political silence" a benefit, or are there real political effects?

The approach taken in the present article is to relate the virtual water debate to the politics of "real water" and food security. It confronts the conceptualization of virtual water as "politically silent" with two real-life cases of water policy at two levels of governance – one a country: Egypt; the other Punjab, a federal state of India – that illustrate the political character of virtual water strategies. As the cases show, a virtual water strategy crucially affects decision-making on "real" water as well as the political and economic power balance between urban and rural populations (the Egypt case) or between the central and regional levels of a state (the Punjab case). This has important consequences for the livelihoods of rural and urban people. As an area of political contestation, virtual water and its consequences in agricultural policy and natural resources governance unavoidably concern issues of power and legitimacy. When confronted with the "real' world, this "politically silent" solution may well be shouted down by the deafening noise of political processes.

The article is structured as follows. First, we present a short discussion of the concept. Second, we question the assumed politically "silent" character of virtual water by discussing the politics of virtual and real water. Third, we focus on the water debate in Egypt, long characterized by a taboo on discussing the policy option of virtual water. Fourth, we examine the emerging virtual water debate in the State of Punjab in India, and its relationship to interstate water and territorial issues. Finally, we draw a brief conclusion on benefits and pitfalls of the virtual water concept.

Virtual water: Rediscovering the political economy

The production of any product requires smaller or larger volumes of water – its "water footprint" (Hoekstra, 2003), or virtual water. But water use for agriculture is under growing pressure of reallocation to non-agricultural sectors and uses.[4] Reallocation and the associated competing claims are socially and politically sensitive. Main

competitors in this arena of water transfers are irrigators on the one hand, and urban, domestic and industrial users on the other. The first tend to lose out, as water use for irrigation is regarded as the least beneficial and productive in market terms (Boelens et al., 2005).

The relation between water and food production can be visualized through the concept of virtual water. A nation can deal with water scarcity through the import of staple foods like wheat and rice so that "countries are, in effect, using grain to balance their water books" (Brown, 2006: 55). Food imports to a water-scarce country can release scarce water for more productive (e.g. industrial) uses (de Fraiture et al., 2004). We will not go into figures here, but to give a basic indication: the amount of virtual water in international trade is estimated at 1.625 Gm^3 (1.6 trillion m^3) annually, 80% of which is related to agricultural production, the rest industrial (Chapagain et al., 2005; UNESCO, 2006).[5] This amounts to 16% of all water use (Hoekstra and Hung, 2003).

Virtual water is useful as it globalizes perspectives on water scarcity, ecological sustainability, food production and consumption (Craswell, 2005) and stimulates reflection on processes of socio-economic change in relation to changing food demands, production needs, pressures on current production systems and the environment (Hoekstra, 2003).[6] The concept may also increase public awareness of water scarcity among consumers, public officials and producers (Wichelns, 2004; 2005).

Allan's (2001) exhortation to include the workings of the "global political economy" in national water balance calculations is a timely antidote to fears of impending water crises. But it is useful to note that Allan's approach leans heavily on a *classical* (Ricardian) political-economy perspective in terms of comparative advantage (Allan, 2003) and the Heckscher–Olin theory of trade, which assumes that trade in commodities in fact means a trade in factors of production (Hakimian, 2003). This reliance has attracted the criticism that comparative advantage is more than just water endowments; even production of water-intensive goods may give a comparative advantage to a water-scarce country or region (Wichelns, 2005). Kumar and Singh (2005) show that there is no correlation between relative water availability in a country and its virtual water trade.[7] In addition, water need not be (and tends not to be) the decisive factor in countries' crop production and trading strategies (de Fraiture et al., 2004; Wichelns, 2005).[8] A water focus shifts other production factors (e.g. land, labor, energy) to the background (Kumar and Singh, 2005).

We do not set out to give a comprehensive overview of this debate; instead the present contribution proposes an alternative avenue. A more contemporary political economy perspective (e.g. Gilpin and Gilpin, 2003) shows that most literature on virtual water tends to conflate states with the people living in their territories, as if there were perfect harmony between state and society and perfect adaptivity between economic sectors. This gives a reductionist perspective of how the international political economy functions to even out local surpluses or deficiencies. The virtual water literature treats water as an economic (Hoekstra and Hung, 2003) or environmental good (Hoekstra, 2003), backgrounding its role as a political good. Attention to "the political" highlights rather different issues with respect to choices for or against a "real" or a virtual water strategy. Deliberately or unintentionally, virtual water policies work as an instrument of power politics that affect the bargaining position of interest groups in society. States may have overriding political reasons for ignoring what Merrett (2003) calls the "Kyoto Consensus" – the prescription to open up markets for the sake of water conservation. It is therefore important not only to concentrate on states that have (silently) embraced a virtual water import strategy like Egypt (Allan, 2001), but also on those who question it, such as India. Both country cases are discussed in this contribution.

Water as a political good

Why do states keep investing in water infrastructure and protecting their farmers rather than let the market do its work? This section discusses the political role of "real" water transport in state-society relations, and their influence on such choices. It argues that water development and sovereignty in (semi-)arid zones are core legitimising state strategies that will not be easily given up. Political manipulation of water scarcity is as important as economic choices are. Dependence on the world market may not only bring moral problems for the North (Merrett, 2003) but also political trouble for states of the South (Richards and Waterbury, 1996).

While water supports biological and cultural reproduction and keeps economies going, it also reproduces political power (Donahue and Johnston, 1998: 4). In economic terms, the key rationale for state intervention is to reduce citizens' transaction costs in filling their needs. The ultimate legitimizing myth for state supremacy is that it keeps people from fighting each other for survival; order reduces transaction costs for citizens. In the course of time, states have, of course, expanded their "security contract", taking on many more roles that cushioning shocks and mishaps in acquiring shelter, food and other needs. Political science literature shows that states do not do this out of the goodness of their institutional hearts. Once we recognise that the state is not a disinterested political actor but a political agent that uses its resources to (seek to) wrest control over the population and economy in its territory, we can see how the state's uncertainty- and conflict-reduction strategy can be self-serving.

A state can never be sure of the continued loyalty of its citizens. Therefore, it develops control tactics ranging from patronage and co-optation to extortion and force vis-à-vis society. Weber (1964) recognised that the state may use force (its monopoly of the means of violence), if necessary, to have its way. Power based on force only is not really power: coercion tends to be unsustainable. Non-violent, subtle forms of power can provide the state with its prime political capital: legitimacy and control. Treating water as a political good procures organisational influence and control rather than an economic or cultural one. "Real water" projects like Egypt's Toshka scheme and India's Narmada dams may not be economically or hydraulically sensible, but they make sense as political capital for governments. For a developing state, becoming a "development(al) state" has proved a strategically powerful avenue that promises increased control and a growing tax base. To find the money, states look where the surplus is: an emerging urban middle class and a reliable water supply for irrigated farming in the countryside. Assured water, often accompanied by assured inputs and minimum prices, ties a rural clientele to the state. But a state cannot afford to ignore the urban masses either, which may revolt if they feel that their security interests are badly served. Rural development promises to make cheap food available for city dwellers.

"Development" therefore is a powerful "hegemonic strategy" sold on the premise that it will benefit everyone, even if it means local sacrifice in the form of mass displacement or environmental destruction (Crush, 1995). This strategy is not only beholden to the "developing world." For example, Spain is also bringing water from its wet north to its dry south (e.g. Naredo, 1999). The main idea is "manipulability" of water and food scarcity. An adequate understanding of scarcity should include how scarcity and resource crises are defined, created, perceived, reproduced, and reduced (Donahue and Johnston, 2001: 5). Water can be "colonized", controlled and deployed to gain and maintain control over people. Resource capture (Homer-Dixon, 1994) and mobilisation reduces uncertainty for economic groups, in turn reducing uncertainty for the state. The design of water infrastructure determines where "real" water goes, who gets it and who does not (Mollinga and van Straaten, 1996; Turton, 1999).

Large and small infrastructural projects, preferably externally funded, are effective ways to expand state control. Thus, providing a reliable source of water helped the Saudi government settle nomadic tribes in the 1920s. Turkey is now in the last stages of building a 22-dam project in the poor region of Southeast Anatolia. These will irrigate the Harran plains and hydro-power new industries. Among other rationales, this "Greater Anatolia" Project can be seen as a way of integrating centrifugal Kurds, creating jobs in irrigation, construction and industry (Warner, 2005).

Who pays for virtual water?

The infrastructural "hydraulic mission" (Reisner, 1986) to mobilise "real water" for national development has well-known social, economic and environmental costs that offset its political benefits. The question is whether, as Turton (1999) maintains, a switch to virtual water is a softer option – for its producers, but especially for its consumers. While Wichelns (2004: 429) stresses that the policy relevance of virtual water pertains primarily to its supply side "because the embedded water concept is pertinent only to producers," there are considerable distributive effects on the demand side, including the importers or recipients of virtual water. Food can be captured, hoarded and sold or withheld at an economic or political premium in the form of conditionality on loans and aid. Governments likewise intervene in the creation or alleviation of food scarcity. Sen has shown that famine can stem from the failure of people to access food (Sen, 1980; Sen, 1981). In times of increasing food scarcity, wheat traders tend to hoard grain. The only alternative for states to secure food for the population is to buy or otherwise obtain food on the world market. For this, one needs foreign currency or must curry favor with aid providers; both entail a political risk.

The world market is not a level playing field (Warner, 2003). Exposure to virtual water trade means exposure to sudden price shocks in the world market, including manipulation of trade politics. Five countries account for 80% of all cereal exports. While the Middle East, due to its geo-strategic position and oil wealth, may have benefited, the same policy prescription is unlikely to work well for, say, Sub-Sahara Africa, whose bargaining position in the global political economy is weaker. Low agricultural world prices hurt agrarian exporters who do not have the option to subsidize their agricultural sector (Neubert, 2001). For poor countries, trade means participation in a system dominated by powerful interests.

A crucial question is: who or what will pay the bill for virtual water imports? Prescriptive virtual water analysis claims that countries should bank on the adaptive forces in the international political economy to diversify their economy. If they do not have to produce all food themselves, they can concentrate their energies on the development of other sectors (as India did, for instance). A "weak" political economy is an unadaptive one, while a "strong" one diversifies. Diversified national political economies fare better than weak ones when faced with drought and scarcity. However, a state that opts for food imports will have to pay its virtual water bill, literally and symbolically. As almost any non-agricultural water use is more remunerative than agriculture, diversification out of

agricultural self-sufficiency (''more jobs per drop'') is expected to generate funds and employment opportunities to more than make up for the loss of food self-sufficiency. For instance, the Singapore economy generates enormous wealth that more than compensates for limited resource endowments (Allan, 2001).

But this trajectory is not easily turned into reality. First, imposed structural adjustment and liberalisation do not wait for economies to be strong. ''What would Yemen export that was not agriculturally based, other than its own people?'' (Richards, 2003: 65). Second, a non-agricultural export state is not necessarily a diversifying economy. Non-agricultural primary sector exports dominate OPEC's oil and gas producing countries, but are owned by foreign multinational companies. Such ''rentier states'' (Beblawi and Luciani, 1987) have felt – or may soon feel – compelled to sign away large parts of their sovereignty over resources developed on their territory to be able to pay for their import bills (Kuwait, Algeria, Bolivia). A virtual water strategy may intensify resource sell-out and increase external dependencies for cash-strapped states. Third, what about states that successfully switch to manufacturing by neglecting their agricultural sector? Given that food imports and aid are usually heavily subsidised in the country of provenance, they easily out-compete domestically produced food, pushing small producers out of the market. Marginal producers have nowhere to go but the city (Merrett, 2003).

At the domestic level, then, a naked switch to virtual water imports in (semi-)arid regions is a choice for the city, which may intensify non-water primary resource sell-out and increase external dependency for cash-strapped states. While we do not advocate economic conservationism, it is important to consider the social costs involved. Therefore, it is all the more important that momentous economic choices like a virtual-water strategy do not remain politically silent.

The political uptake of virtual water

It is tempting to see virtual water as ''so much hot air''. But there is a danger in not taking seriously its potential for informing far-reaching policy decisions. The politically efficient but economically inefficient state-led ''hydraulic mission'' of dams and development is under attack from both free-marketers and environmentalists. Aggressive resource capture for agrarian development brings basin conflict, environmental destruction and ''closure'' (see Williams, 2003. These costs make it unavoidable to start a painful adaptation process towards a post-''hydraulic mission'' economy through diversification of exports and reallocation of water outside agriculture, so that the pressure on water resources is relieved. Water stress in ''closing basins'' impel a switch to a different hydro-social contract based on economic principles like pricing and cost recovery and, indeed, virtual water, to arrive at more environmentally sensible management (Turton and Ohlsson, 1999).

Molden and de Fraiture (2004) doubt whether countries will change their trade policies because of pressing global water scarcity issues. However, several policy-makers have taken good notice of the virtual water debate, not so much to save the planet as their own economies, while virtual water could become part of an existing ''green conditionality'' – environmental goals as a form of donor leverage over national governments who are not so quick to catch on (Leach and Mearns, 1996).

Israeli water managers, faced with acute water crisis in the 1980s, were the first to realize that every exported orange meant a loss of scarce water (Allan, 2003; Fishelson, 1994). In the 1990s, Jordan's former Water Minister Haddadin became a fan (e.g. Hoekstra and Hung, 2003). Jordan now imports 60–90% of its food. Policy makers in South Africa ''got it'' at a conference in Oman in 1995 (Allan, 2003). A virtual water strategy would obviate the need to build more expensive infrastructure for intra- and inter-basin transfers.

Indians also paid close attention (Reddy, 2005; Sharma, 2003b; Sivakumar, 2004) when virtual water reached the global water agenda at the March 2003 World Water Forum. Here, the debate is highly unlikely to be ''politically silent'' – water and food sovereignty also have a powerful political identity value. Sharma, echoing Leach and Mearns (1996), observes that ''countries of the South rightfully wonder if this will be yet another imposition on them! Otherwise why should 550 l of water to produce flour for one loaf of bread be of greater concern that 7000 l for producing 100 grams of beef?'' (Sharma, 2004). *The Hindu* quotes Daniel Zimmer of the World Water Council, who claims that ''countries like India and China … feel that because they have such large populations, the world market would not be able to supply their food demands in any crisis and so … they want to take care of their own food needs'' (Sivakumar, 2004; see Cai and Rosegrant, 2005).[9]

Instead, both countries are pursuing a food self-sufficiency strategy (World Water Council, 2004). India even seems to be intensifying its virtual water export strategy: ''… while India is gripped by a severe water crisis, and even more severe water conflicts, our Deputy Chairman of the Planning Commission [Montek Singh Ahluwalia] is recommending that we export water as a 'virtual water' subsidy to the rich consumers of the North'' (Shiva, 2005) in the form of water-intensive products like vegetables and fruits. However, a reverse trend of buying farmers out of water-intensive cultivation into cultivation of other crops is also visible in states with severe groundwater problems like Punjab (see below).

The case of Egypt is intriguingly paradoxical. Applauded by virtual water analysts for shifting from virtual water export to imports in the 1970s, it has long resisted the virtual water discourse itself. The silence over virtual water allowed Egypt and other Middle East states to avoid having to admit the painful truth that water supplies are limited – which might lead to a legitimacy crisis – while at the same time adjusting their economies to that truth. However, this quiet adjustment has not been without its social price. The next section will take a closer look at food security, real water, and virtual water in Egypt.

Egypt: A not so silent virtual water revolution

To what extent can Egypt's food policy be analyzed as based on a conscious policy decision to implement ''virtual water policy''? For the Egyptian state, the myth that water will always be available has been an important legitimising dogma, both for the domestic (voters) and the international audience (upstream states and donors). A Ministry of Public Works and Water Resources expert said that the idea of there being water shortage is absurd. Like many of its neighbours, Egypt has hardly begun to contemplate the kind of ''demand management'' all water-poor states will eventually have to accept, however painful the transition will be. In Egypt, the dream of ''water self-sufficiency'' is alive and well.

In such a context, a prescription that Egypt should turn more to the world market is anathema. When Beyene and Wadley (2004: 35) discuss this as an option, they voice concern that the market mechanism does ''not account for the different social meanings attributed to water across state boundaries …. It is hard to predict … how far the Egyptian farmers are ready to buy the idea of detaching themselves from producing agricultural products, should the Egyptian government agree to implement the 'virtual water' scheme.'' What seems to have escaped the authors is that Egyptian food producers – whether they ''buy the idea'' or not – have already been adjusting to a virtual water strategy for over 30 years.

Egypt's 1959 ''Full Utilisation of the Nile'' treaty with Sudan initially seemed to leave enough slack for expanding water use for food and cotton production. But expanding demand due to a population boom put pressure on Egypt's water quota. Egypt's switch back to the West entitled it to generous food aid and cheap imports, reducing dependence on this quota. Nowadays, imports meet half of Egypt's food requirements; food constitutes 10.8% of Egypt's imports bill. Importing food now saves Egypt a Nile's worth of premium water.

In this way, a ''silent revolution'' has realised an economic adaptation process which spares the government an embarrassing political debate on the question of whether the state is accountable for a looming water shortage and dependency on the rest of the world, a debate Egyptian officials prefer to keep silent about. Egypt's water professionals, some occupying strategic positions in the UN and World Bank system, have long refused to acknowledge and discuss virtual water (Allan, 2001). The emphasis on political silence revealingly portrays politicisation as needlessly problematic and political contest and popular protest as undesirable. However, political contests about the road ahead can contribute productively to debates about how to adjust to scarcity and its allocative implications. Applying and silencing virtual water means avoiding tough decisions on rights and allocation between social groups and countries, as well as on the relations (hydro-social contract) between state and society.

When Nasser came to power in the 1950s, he sought political support in the countryside by pushing through a land reform (Bush, 2005). But the availability of cheap, imported food and a swelling Cairo mean the countryside is no longer a priority. As Richards and Waterbury (1996) have noted, Egypt's geography allows all food imports to come in at a central location and be distributed for food coupons to the growing number of urban poor. After the IMF forced Egypt to take austerity measures, ''bread riots'' broke out in Cairo in 1977. The Egyptian state focused on the urban electorate while the infrastructural links with and investments in the countryside were neglected. Imported, subsidised food brings wealth to harbours, not to farmers. Their bargaining power is eroded, which may lead to further marginalisation. Moreover, like the Aswan High Dam, the harbour creates an ''obligatory passage point'' not open to most other states. It is easier to control the distribution of imported food in the harbour than of food produced by millions of *fellahin* (small farmers) in rural areas (Richards and Waterbury, 1996). A virtual water (import) strategy has thus strengthened political control while widening a socio-economic gap between mega-city and countryside (and between North and South Egypt). All such factors intensified the rich-poor divide.

Nowadays the revolution is not so silent anymore. In a second IMF-impelled wave of reforms, Egypt liberalised its agrarian policies and reformed land tenure; over a 5-year period, tenants had to return their land to the landowners. They had rented this land for 40 years at fixed rates; now the rents were allowed to skyrocket. As a result, widespread violence broke out in the countryside, due to police-assisted evictions of tenants. The inevitable outcome was for tenants to swell the shantytowns of Cairo (Bush, 2004, 2005).

While American food aid and low world food prices eased the stress on Egypt's water resources, Egypt also has strategic reasons not to shout about it. In its Nile negotiations, Egypt wants to uphold the claim that the

country needs the 55.5 billion cubic metres it is entitled to under the "Full Utilization of the Nile" treaty signed with Sudan in 1959. Waterbury and Whittington (1999) have shown how Egypt's new land reclamation schemes are a strategy to create facts on the ground. In the context of the Nile Basin Initiative, Egypt may be able to stop any upstream water resource development claiming these "needs". Some suggest that equitable distribution means that Ethiopia, which was not party to the 1959 treaty, should get at least as much Nile water as Sudan (e.g. Tafesse, 2000). If virtual water were formally incorporated in Egypt's water balance, very different figures might emerge and weaken Egypt's claim on the Nile. Instead, Egypt is planning to irrigate 300,000–500,000 hectares and house 6 to 7 million inhabitants in the hot desert, in light of Egypt's supposed overpopulation pressing on a narrow strip of fertile land (19,000 square miles).[10] This New Valley project aims to irrigate 300,000–500,000 ha in a vision remarkably similar to that of the colonisers of the American West – develop the land and the rain will come (Worster, 1992) – the Valley will need 5–10 billion cubic metres per year in a country where it rarely rains.

Things seem to be moving, though. During the Fourth Water Forum in 2006, Egyptian water officials came round to at least recognising the virtual water concept.[11] Egypt is now using water-saving technology, improved drainage, drip irrigation, stepped-up recycling efforts and levelling of arable land. It is also moving agriculture out of water-guzzling crops, notably through cuts in rice and sugar cane. This seems, finally, to evidence an acute if tacit awareness of need for demand management. Egypt will economise, recycle, and modernise its way out, but does not seem ready to admit a water shortage, let alone allow virtual water a place in Nile negotiations.

Depleted groundwater and redundant food stocks: The case of Punjab, India

The Egyptian case shows that the rural peasantry has been more or less "given up" by the state that opts for virtual water imports in favour of the urban poor. The following case from India, a country following a strategy of food self-sufficiency, illustrates another dimension of the politics of virtual water and food production. The case focuses on plans to shift agricultural policies in the Indian state of Punjab away from water-intensive crops (rice, wheat), for which no ready market exists, towards less water-intensive crops with, it is hoped, a more promising market potential. The combined pressures of a perverse food grain production system and ecological degradation have made Punjab's status as grain exporter to other states increasingly problematic. The plans were presented in the report of the Johl Committee (Chief Minister's Advisory Committee, 2002).[12]

Historically, the role of India's government has been overwhelming. At independence in 1947, India had to import huge quantities of food grains to feed its rapidly growing population. After the instatement of U.S. Public Law 480, India became the biggest recipient of American food aid in the early 1950s. This likely enabled India to concentrate on industrialisation and, some claim, neglect its agricultural base. But dependence on aid had serious political implications. American food aid was tied to political and economic concessions (a more open market) in the 1965–1966 famine. In 1974, India switched to the Soviet Union for food aid.

Given that memory, it is not surprising that, ideologically, agriculture is the backbone of development in India. Gopalakrishnan, Secretary General of the International Commission on Irrigation and Drainage (ICID): "a country must be food secure (self-sufficient) before any trade can begin. Can empty bellies attempt to trade, especially if the needs are sizeable and 'purchase power' is lacking?" (Sivakumar, 2004). There is a political determination never to be dependent on food aid and imports again.

In the mid-1960s, India still imported more than 13 million tonnes of food grains.[13] However, the Green Revolution was boosting food grain production in, for instance, Punjab. India has a food grain procurement system through the Food Corporation of India (FCI) that guarantees a minimum support price (MSP) to producers. As a consequence of this policy, in 2002 India had built up a food stock of about 70 million tonnes (while only 22 million tonnes are needed for its buffer stocks for national food security). These stocks exist side by side with poverty and malnutrition among those without access to resources or to the market.

However, wheat and rice production has reached such high levels that stocks are growing while no ready markets exist.[14] Often wheat and rice crops replaced other crops for which a strong demand existed like oilseeds, pulses and coarse grains. This remarkable growth was made possible by a combination of incentive structures, input policies and infrastructural works. After a period in which national production was growing while imports continued, in the 1980s India became net exporter of food grains. In the meantime, the fact that supply exceeded (effective) demand had turned the subsidy system from a benefit into a major financial burden to the central government. Social tensions created by prevailing market conditions (production costs increasing more rapidly than minimum support prices) arose.

Two earlier reports on reorganization of the electricity tariffs and diversification had warned against food grain sector problems in the 1980s,[15] but to no avail. The

government even stimulated groundwater extraction through electric pumping by keeping (flat) electricity rates low. This has always been an instrument for politicians to win political support from rural voters. In the 1980s, with a 20 million tonnes increase of Indian paddy and wheat production in a few years, food grain demand was soon getting satiated. As procurement policies became a burden to the central government, it started imposing excessive quality standards. This led to further stagnation in procurement and increased farmer protests.

These developments and a growing awareness of the ecological impact of intensive wheat–paddy cultivation – primarily groundwater depletion – made it clear to the 1980s Committee on Diversification that a shift towards technically feasible and economically viable alternatives like pulses and oilseeds was needed. In its advice, the committee had to maintain a shaky balance between farmer interests and state interests, state interest and national interests, and between the mechanisms of a market economy and food needs of the poor. The Johl report states that "… the production of food grains could not be considered in excess of the real needs of the nation …. Yet, due to the lack of demand, primarily because of the low purchasing power of the poor in the country, supplies of food grains appeared to be in excess" (Chief Minister's Advisory Committee, 2002: 6).

Paddy and wheat farmers were and are not enthusiastic. Returns from alternative crops will be lower, market prices and demand less predictable, risks higher, and storage possibilities smaller. Nor were there new incentives in agricultural policy to make farmers shift. Thus, while market prices for alternative crops were higher than the minimum support prices (MSPs) guaranteed by the government, for wheat and paddy the MSP was higher and continued rising.[16] In this situation "the farmers have to per force continue producing wheat and rice crops in the state" (Chief Minister's Advisory Committee, 2002: 10).

The politics of virtual water and real water

In Punjab, stagnation of food grain marketing due to an agricultural policy based on perverse incentives to farmers and over-extraction of groundwater were the key issues. While "virtual water" is not explicitly mentioned in the report, the virtual water debate plays an important role. Apart from other environmental problems, the report pays much attention to excessive groundwater exploitation associated with intensive irrigated rice and wheat cropping in Punjab. In the "dark zones" of Punjab (Sharma, 2003b), the situation is critical and rapidly deteriorating.[17] The groundwater table is declining by 30 cm per year, and the critical depth (below 10 m) has been reached in 28% of the state. In Central Punjab, which produces 65% of Punjab's rice and 64% of which is under rice crops, the situation is worse than average (46% below critical depth in 1994). Tube well irrigation covers 79% and canal irrigation 21% of total irrigation needs. Punjab is paying a high economic, ecological, social and political price for being the granary of India. The current practices may "soon prove to be economically disastrous, socially untenable and politically unsustainable" (Chief Minister's Advisory Committee, 2002: Annexure 1).

The Committee, therefore, formulated radical measures to restructure agriculture. It stresses the need to "rationalize the utilization of scarce water resources of the state by the farmers, because it is a national resource belonging to the society as a whole and cannot be allowed to be irrationally exploited." It also warns that the existing conditions "might lead to a situation where the possibilities of serious social unrest develop due to the lack of market clearance for the produce of the farmers" (Chief Minister's Advisory Committee, 2002: 17).

The Johl committee advises to replace at least one million hectares of paddy and wheat land by crops that guzzle less water and find a stronger market demand. Currently the central government incurs a huge financial burden of procurement, handling, storage, damage and loss, and transport of a product that has no market demand. These can be used to subsidize paddy–wheat farmers into alternative crops. To this purpose, the central government should provide the state government with funding for a "Crop Adjustment Programme". Again, the debate is about supply and effective (market) demand, not about the societal need for food: "although these high stocks are in a sense illusory when viewed from the perspective of nutritional needs of the Indian population, because more than one-third of the people in the country cannot meet their minimum nutritional requirements for healthy living, yet this supply-demand mismatch is of serious concern, because it puts heavy financial burden on the state exchequer" (Chief Minister's Advisory Committee, 2002: Annexure 1).

Are there any (partial) alternatives to these radical measures? The report mentions a number of changes in agricultural practices to make cultivation less water-intensive. Further, the development of more water-efficient paddy strains might provide new solutions to water scarcity. However, Sharma wonders whether the current political-institutional environment is conducive to the introduction of alternatives to subsidized measures. His doubts concern the use of subsidies to undo the current conditions that are the product of earlier subsidy politics, and the political character of agricultural policy and the important role ascribed to the private sector in a readjusted agriculture.[18] The adjustment plan fully depends on central government subsidies as an incentive for shifting to alternative crops. These subsidies serve various purposes, both agricultural-economical and political (Sharma, 2003a).

In the meantime, contract farming is being propagated by the state government as the new future of a diversified agriculture in Punjab and other Indian states (Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu). Sharma (2006) concludes for Punjab that the "Government's obsession with diversification of crops has exposed farmers to the vagaries of corporate interests in the state".[19] Contract farming does not work, according to Sharma, because corporate interest in Punjab primarily goes to water-guzzling *basmati* rice. In addition, the quality argument is often used to reduce prices paid to farmers.

Where virtual water is the topic of debate, "real water" politics are never far away. In 2004, Punjab enacted the Termination of Agreements Act. This act repealed existing agreements on inter-state water sharing. Punjab Chief Minister Singh legitimized this step, which threatens access to water for neighbouring states like Haryana and Rajasthan, with reference to water scarcity and the need for agricultural diversification. The Chief Minister was cited saying: "the question … before all of us should be about the future of Punjab …. What Punjab is going through should be of concern to the nation because it is we, who helped the country build up a huge food grain buffer stock and protect its food security and help it run its food distribution system" (Gill and Batth, 2004).

The issue focuses, among others, on the 306km Satluj–Yamuna Link (SYL) Canal linking Rivers Satluj and Yamuna. Punjab refused to build the last section of the canal. This brought the state into conflict with neighboring Haryana (which would be the main beneficiary). The Punjab government argues that water transfers would seriously affect its own farmers and make groundwater recharge impossible. There even was political pressure in favor of scrapping Section 5 of the Punjab Termination of Agreements Act, which still guaranteed continued use of water from two rivers (Ravi and Beas) by the non-riparian state of Haryana (Venkatesan, 2004; Tribune News Service, 2005).[20]

Significantly, the conflict is not only about water but also about geopolitics: Punjab has a number of long-standing territorial claims on Haryana – to hand over the town of Chandigarh and swap Hindi- for Punjabi-speaking areas in the border area. These issues were dealt with in a 1985 treaty that also foresaw the building of the Satluj–Yamuna Link by Punjab but was never implemented.[21] Both territorial and water issues can be traced back to the division of Punjab into the three smaller states of Punjab, Haryana and Himachal Pradesh in 1966.

In this context, the Punjab debate on crop diversification spawned by the crop adjustment programme plays an important political role in two ways. First, it has created a lot of unrest among wheat and paddy farmers. Many farmers fear they will suffer the negative consequences of crop diversification: reduced incomes, greater uncertainty and insecurity. Hence, they refuse to leave the wheat–paddy-cropping pattern with its minimum support price and guaranteed marketing opportunities (Pandher, 2006; Shergill, 2005). In the perception of many farmers, crop diversification would not even be necessary if the state's river water would not be shared with other states. Hence, there is a strong rural pressure on the state government to take a harsh stance in its real water negotiations. Farmers' organizations, for instance, demanded cancellation of all water treaties in which Punjab is involved.

Second, state politicians can use the affair for their own political purposes and power games. According to Swami (2004) "emotive mass mobilization on river water issues has been a way for politicians to deflect attention away from the very real agrarian crisis they face and the need for serious, constructive reform." Thus, the current focus on inter-state litigation, blaming and claiming hides the issues of inefficient state irrigation policies, the cultivation of water-guzzling crops, and the need for water conservation and spread of water-saving technologies: "neither state government … seems willing to even discuss the possibility that the right kind of public investment and usage policies could be more important to their long-term water security than the loss or gain of water through the SYL canal" (Swami, 2004).

Conclusion: Virtual water, real politics

On its journey from analytical concept to policy tool, "virtual water" is now increasingly in vogue to make states more adaptive to resource scarcity pressures and related environmental shocks. In this article we have, first, introduced the concept of virtual water and pinpointed some of its advantages and pitfalls in analyzing issues of water scarcity and food security. A major contribution is that it highlights an otherwise hidden externality of global trade and its consequences; for food importers (focus of attention in virtual water analyses) as well as exporters (the focus of attention of water footprint analysis).

For states facing water shortage, virtual water is part of a wider palette of policy choices: moving water to people (infrastructure), moving people to the water (zoning, resettlement), importing food (virtual water), and demand management (saving water). A choice between a "real water" and "virtual water" policy, however, is a political as much as an economic choice. Constructing infrastructure means control of people and production, prestige, self-esteem and sovereignty. Virtual water import means central control of urban food supplies, freeing states from obligations to rural development and reducing resource base mining.

Without passing judgement on whether liberalization is a better idea than subsidized agriculture, our contribution sheds light on a number of political and practical reasons why states and social actors may resist a shift towards a market-dependent virtual water strategy in countries that have so far aimed for food self-sufficiency. It has allocative and (possibly destabilizing) social effects. It also impacts on established relations between countries (e.g. Ethiopia and Egypt), between states (e.g. Punjab and neighbouring states), and between states and urban and rural interest groups in society (policy shifts away from rural producers' interests in both Egypt and Punjab).

Scarcity can be induced and conditional. Economically weak states without matching funds to pay for food imports will have to accept loans and food aid with political strings attached. While the U.S. has discontinued food aid for political purposes to Egypt (a middle-income country), Richards (2003) notes that American governments are giving other client states cash in hand to pay for food imports. The cases of Egypt and India show the consequences of this dependency. Losing food sovereignty may expose a state to embarrassing political blackmail on the international scene, as especially India has experienced. As water and food are political capital, and sovereignty is furiously guarded, states will think twice before opening up their economies.

What happens if a water-stressed state decides to shift from food production to food imports but manages to keep quiet about it? Egypt decided to cut its "special relation" with the countryside and pacify its urban client base with food coupons. This has inevitably led to increased urbanization accompanied by social and political tension. It was a mirage to expect that farmers could easily adapt to international price shocks. Egyptian farmers have, indeed, proved unable to compete with subsidized imports and food aid, and moved to the city. In this sense, a virtual water policy is almost a virtual resettlement policy.

Virtual water also impacts on political relationships. States struggling to remain in control dread an image of scarcity and dependency in water domain or food domain. In Egypt, the change from export to import has long been too embarrassing to discuss. While the "political" silence surrounding virtual water may have been comfortable for Egypt's water authorities in the short term, it has negated and postponed more fundamental social debate on water and food. The question whether this is a good thing from an ethical perspective is legitimate, but beside the point, our contribution suggests that such issues will find their political expression anyway. In Egypt, the switch to imports and land liberalization has had livelihood effects which now find political expression, whether in social instability or parliamentary demands.

A public debate on the need for, and the price of, adaptivity may lead to demands for accompanying measures like compensation, or even to a decision against relying on virtual water imports. This case study suggests an interesting difference between virtual water imports and exports. In Egypt, the need to conserve water has opened up the arena for a debate on rationalising water *exports*. This can be framed as a relatively safe debate on demand management, efficiency and resource conservation. Virtual water *imports*, however, remain touchy due to the political taboo of dependency and vulnerability in a "strong state".

The Punjab case illustrates similar dimensions of the virtual water debate. First, like the Egyptian case, it illustrates the political character of decisions concerning water allocation and food production. However, in India there is no taboo on the political debate. The burgeoning debate shows that the proposed turn away from staple food production shakes up established interests and relationships. Finding "the" solution to scarcity in an arena where any policy move is heavily politicized and contested by one of the parties involved is not possible without inflicting pain on one or more parties; one party's solution is another's nightmare.

The Indian situation is complicated by the differential or contradictory interests of state and central government. The state's need for agricultural reform may be seen in the long term as a threat to national food self-sufficiency. It also goes against the short-term interests of food producers who enjoy the advantages of a subsidized and secure market. However, doing nothing would ultimately chase farmers away from food grain production. Whatever direction the food policies of the state of Punjab and India will take, it is bound to be heavily politicized and have this complex component of multiple levels and scales of governance.

Where the Egyptian case underscores the importance of linkages between the virtual water debate and transboundary "real" water issues, the Punjab case shows similar linkages between virtual water policy and real water issues with political consequences for relationships between states as well as between Punjab and the national government. The pressures exerted by farmer organizations to revoke water-sharing agreements with neighbouring states shows that rural populations are indeed a political force to be reckoned with. However, their current role is primarily the outcome of a long history of strategizing by political elites bent on extending their power into rural areas.

Therefore, we must add virtual water strategies to those based on a "real-water" hydraulic mission, resettlement and demand management as strategies with redistributive outcomes and political effects. It is crucial to realize that, when states show enthusiasm in exploring sustainable social and environmental water use, political sustainability is never far from their minds.

Acknowledgements

We would like to thank Sudhirendar Sharma, Kai Wegerich, the participants of the 'Natural Resources and Food Security' workshop organized by the Law and Governance Group of Wageningen University and Research Centre, and three anonymous reviewers of AHUM for valuable comments and suggestions.

Notes

1. Also called 'embedded', 'encapsulated', 'shadow' or 'supposed water'.
2. The concept can also be applied to other (non-food; non-agricultural) goods and services (Hoekstra and Hung, 2003) and resources (e.g. land, labour).
3. In relation to issues like urbanisation, globalisation, food aid, food imports, and food habits.
4. In 2000, an estimated 67% of the world's total freshwater withdrawal went to agriculture. By 2025, water requirements in agriculture will have increased by 1.2 times, in industry by 1.5 times, and for domestic consumption by 1.8 times (UNEP, 2002).
5. About one fifth of total world trade; 80% of virtual water flows is embedded in agricultural, 20% in industrial products. Produced with an actual 1.2 trillion m^3 per year, a 352 billion m^3 saving is claimed, especially in crop production. The "water footprint," which can be determined internally or externally, for individuals or nationally, expresses water use in relation to consumption (Chapagain et al., 2005; UNESCO, 2006: 392).
6. Thus, turning vegetarian reduces your water footprint by 4,000 l a day!
7. Countries with high water availability like Japan, Portugal and Indonesia have high virtual water imports, while Afghanistan, Malawi, India, Thailand and Denmark are water-stressed but export much virtual water (Kumar and Singh, 2005: 765, 785).
8. Political and economic considerations like production increase for food self-sufficiency, poverty reduction and food security may be more important and constrain policy options for virtual water trade, especially for poor countries sensitive to price fluctuations on the food market (de Fraiture, 2004; World Water Council, 2004; Kumar and Singh, 2005). A contrary trend pushes countries away from food self-sufficiency, to meet the growing water demand from other sectors (Kumar and Singh, 2005).
9. Reddy argues that a virtual water import strategy will, for socioeconomic reasons, not be relevant for India. He sees, however, three important contributions of the concept: for critical consideration of exports (India being the fifth largest virtual water exporter in the world); for making agricultural policy choices between states to optimize water use; and to increase public awareness of the resource consequences of consumption (Reddy, 2005).
10. Just 5% of Egypt is inhabited by some 63 million Egyptians. Egyptian "decentralisation policy" has resettled hundreds of thousands of Egyptians and seeks to resettle 6 million more. Mitchell's (1995) analysis of World Bank documents however shows that the portrayal of Egypt as a space-constrained country in need of development is unfounded.
11. Personal communication with J.A. Allan, May 11, 2006.
12. We thank Dr. Sudhirendar Sharma, director of the Ecological Foundation, Delhi, India, for discussing with us the Punjab case and sending us a copy of the report of the Johl Committee.
13. Unless stated otherwise, this section is based on information found in the Johl report.
14. The state produced 3 million tonnes of foodgrains in 1961, and 25.3 tonnes in 2000–2001. Thus, its share in total national grain production amounts to 12.9% (22.6% of wheat and 10.8% of rice) (Chief Minister's Advisory Committee, 2002).
15. The committees responsible for these earlier reports had also been chaired by Johl.
16. Thus, in the 1990/1991–2001/2002 period the MSP of paddy increased by 159%, that of wheat by 184% (Chief Minister's Advisory Committee, 2002: 8)
17. "Dark zone" areas suffer from severe groundwater overexploitation. See Prakash (2005).
18. Readjustment towards proposed market crops will make farmers dependent on unstable and uncertain markets and buyback arrangements with the private sector.
19. In 2005 some 80,000 hectares had been brought under contract farming in Punjab (Bhatt, 2005). Punjab has targeted one million acres or 10% of its total acreage by 2008. Main player in this reshuffle of agriculture is the Punjab Agro Industries Corporation (see Sarkar, 2004).
20. Punjab claims that non-riparian states like Haryana are not entitled to water from these rivers (Swami, 2004).
21. The Rajiv Gandhi-H.S. Longowal accord (Swami, 2004).

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