WATER SCARCITY AND FOOD SECURITY

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By the year 2050 we will be facing the formidable challenge of feeding 9 billion people equitably, and safely. While developments in biotechnology and plant sciences are providing one set of potential solutions to improving food production, water is still going to be the single most important factor in our ability to achieve food security.

Water is often left out of the debate on food. Much of the developing world is water scarce – either in physical terms with a lack of water resources, or in economic terms with a lack of the critical infrastructure and institutions required to make the water accessible. This means that a vast majority of the world's poor are living in areas where growing food is difficult and only going to get harder given unprecedented population growth and climate change that are predicted to put huge stress on our resources. Two years ago, the Comprehensive Assessment of Water Management in Agriculture [1], which brought together over 700 scientists to ask how lessons from the past fifty years of water development and management can guide the future, stated that we cannot continue with "business as usual." If we are to focus our attention on solutions, the key questions to ask are – how are the richer countries going to help poorer countries increase food production and resilience against unexpected shocks? And, what can poorer countries do to help themselves?

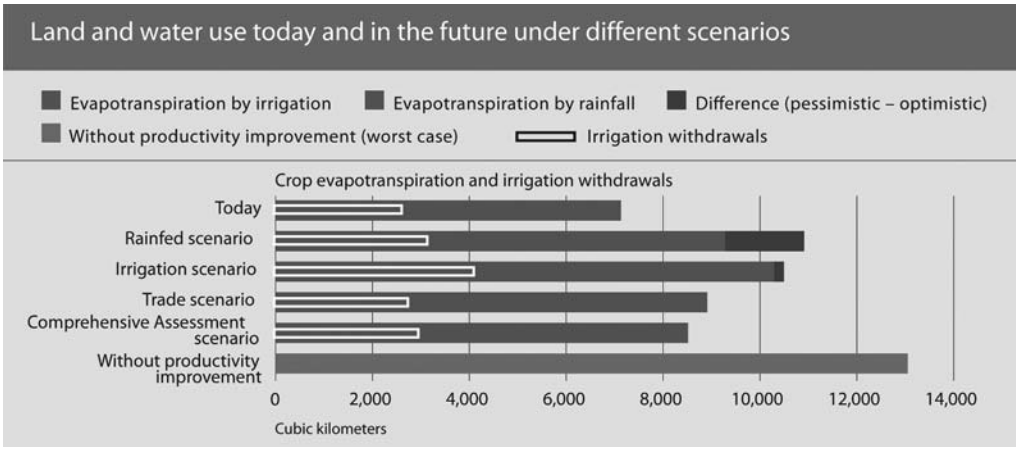
DRIVERS OF WATER SCARCITY

The scale and extent of the water scarcity that we will face is being driven by several factors most of which are fairly clear.

It is estimated that around 1.4 billion people live in areas where water is over-exploited, and about 1.1 billion of those live in areas with a severe water shortage. With the world's population forecasted to reach 9 billion by 2050, between 3 and 5 million people will live in areas with acute and chronic water shortages (equal to or less than 1000 cubic metres per person per year). To date, it has been the environment that has suffered as water use-to-availability ratios rose. Whilst many ecologists would argue that a 40% ratio is a threshold above which ecosystem health is impacted, there is a growing number of major rivers that hardly reach the sea any more resulting in "closed basins". Included in this number are the Murray (Australia), Yellow (China), Krishna (India) and Colorado (USA) rivers. Population growth therefore represents the biggest single threat to water supplies and food production.

Changing diet is proving to be an important driver of water scarcity. In order to grow 1 calorie of food, 1 litre of water needs to be evapotranspirated. As large numbers of people in developing countries grow more affluent their taste in food has moved from diets rich in grain and vegetables to consumption of more protein-rich foods. A diet without meat requires about 2000 litres of water per day to produce, while it would take about 5000 litres per day for an animal protein-based diet. Put another way, a global population of 9 billion will need a further 2500-6000 km3 of water for food production depending upon the degree of crop/water productivity, food losses prior to market and wastage after preparation. The upper figure is almost twice the amount of water used in agriculture in the year 2000.

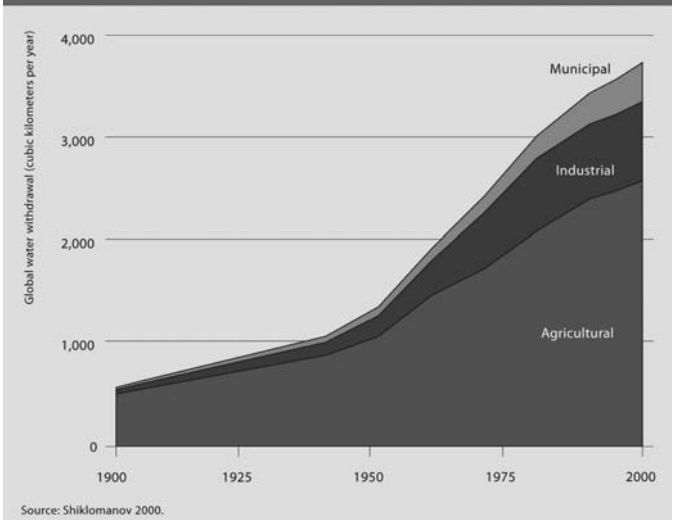
Although the global financial crisis has seen oil prices fall from US $150 per barrel to US $37-70 per barrel over the last 6 months, fossil fuel demand over the forthcoming decades will inevitably see demand for biofuels similarly increasing. So-called first generation biofuels production, derived from corn, beans and sugar, create competition not only for land, but also for water. If ultimately this competition takes over 10-15% of agricultural land, the impacts on food production will be very significant. However, there are many uncertainties on the future impact of biofuels on food production.



In 2008 the world saw a transition from one in which more people lived in rural environments to one with more people in cities and towns. The transition point has not yet been reached in developing countries, however worldwide bigger cities with more industry clearly already compete with agriculture for water resources and this competition will increase. Cities also have more political power and the wealth to buy water from other users. Currently many agricultural developing countries and developed countries/states such as Australia and California use 70% or more of their total available water resources in the agricultural sector. Even if growing urban demand only requires a redistribution of 5% of this water it will have a significant impact on the ability to grow food. Globalisation is also having a range of impacts on food production as the demand for luxury goods, such as cut flowers, creates competition for land and water near international airports. Other similar trends include product sourcing policies of supermarket chains in developing countries and the recent phenomenon of large food importing countries wanting to buy up large tracts of land in developing countries for food production. Competition for water from the hydropower industry also means that water for agriculture is no longer available at the right place at the right time. All these kinds of drivers may significantly impact food production in developing countries and have both beneficial and adverse impacts on their populations.

Climate change research has yet to provide us with an understanding of just how it will affect food production at local and regional levels. However, there are several signs that indicate that there is cause for some concern. Rainfall and runoff records from countries with Mediterranean climates, such as southern Australia, Spain and Morocco, already indicate that declines in rainfall of up to 30% may be expected. Studies are also indicating that in some environments for each unit decline in rainfall there is up to a threefold decline in runoff. Data from Central Asia also suggest that in the long term (30-50 years), runoff from mountain snow melt may also reduce by at least 30%. In some of the subtropics of Africa, rainy seasons are starting later, have more intense rainfall and are of a shorter duration. Even in areas where rainfall is predicted to increase, increases in rainfall intensity may lead to more erosion and flooding. To what extent such climate change and variability induced impacts on water availability may be compensated for by production being enabled in areas previously too cold for grain is uncertain but an inescapable fact is that many of the world's poor live in tropical and subtropical countries likely to be deleteriously impacted by climate change.

Sectoral competition is increasing for blue water withdrawals for human uses



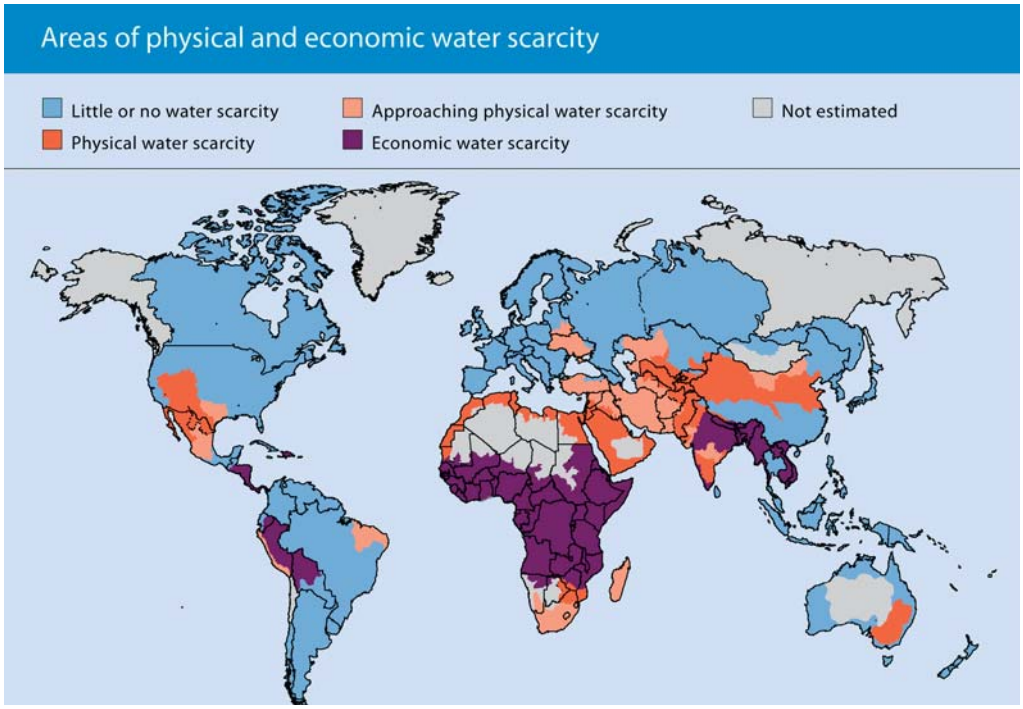
Source: Shiklomanov 2000.

SOLUTIONS DO EXIST

Easy as it is to say that we need to change the way we think about water and agriculture, one of our biggest challenges will be to look beyond rivers and groundwater as our main sources of water for food production. In parts of the world that are dependent on seasonal rain for food production, improving water storage to save and collect this valuable resource could improve the productivity of smallholder farmers, particularly in Africa. Ethiopia, which is typical of many sub-Saharan African countries, has a water storage capacity of 38 cubic metres per person. Other simpler solutions are also part of the equation. These include the construction of small reservoirs, sustainable use of groundwater systems including artificial groundwater recharge and rainwater harvesting for smallholder vegetable gardens. Improved year-round access to water will help farmers maintain their own food security using simple supplementary irrigation techniques. The redesign of both the physical and institutional arrangements of large and often dysfunctional irrigation schemes will also bring the required productivity increases. Wise, risk-free reuse of wastewater from growing cities will also be needed. Of course these actions need to be paralleled by development of drought tolerant crops and the provision of infrastructure and facilities to get fresh food to markets.

In Asia, agricultural productivity can be enhanced not only from improved yielding and disease resistant crop varieties and varieties adapted to changing climate conditions, but also through a revolution in irrigation system performance based on improving infrastructure and water users' participation in system operation. Similarly, better understanding and management of groundwater may be the difference between life and death for some poor south Asian farmers and an effective climate change adaptation strategy for some African farmers. The challenges are immense and must not be underestimated. A critical point in our view is that, given the complexity of current agricultural and natural resource systems, effective solutions to increasing food production have to be broader than just crop breeding.

Water for agriculture is coming under severe competition and needs to be an integral part of the solution. With approximately 1 billion people, predominantly in Asia, under the poverty line and at risk of further malnutrition, the stakes are also very high from a social and political perspective. The challenge of feeding the world and providing enough water to facilitate this is daunting, given that the consequences of failure will have profound ramifications for rich as well as poor countries. It is a challenge that



will only succeed if investment in agriculture and natural resources management is seen as the key to a more prosperous and stable future for the poor and a basis for helping poor countries increase their gross domestic product and thus move up the development pathway.

[1] The Comprehensive Assessment of Water Management in Agriculture was led by the International Water Management Institute. Results of the five-year long study was published in 'Water for Food; Water for Life: A Comprehensive Assessment of Water Management in Agriculture" (2007).

THE ANCIENT SCOURGE OF MALARIA:

IS THE END IN SIGHT OR IS THE PARASITE ABOUT TO STAGE A COMEBACK?


Leaf from an *Artemesia annua* plant from which artemisinin is derived Photograph by William Daniels

Stephen O'Brien MP Chairman of the All Party Parliamentary Group on Malaria & Neglected Tropical Diseases; Chairman of the Malaria Consortium; Vice-Chairman, Liverpool School of Tropical Medicine; and Prudence Hamade from Malaria Consortium

Malaria has been described in medical literature for over 2000 years and has seriously impeded the economic and social development of endemic countries. Nearly one million deaths are recorded each year, and in 2009 half the world's population remains at risk. In Africa, where transmission is highest, deaths are most common in pregnant women and children under five, but older children and men are also affected by malaria that can lead to chronic anaemia and result in loss of school attendance and work.

Malaria disproportionately affects the poor, particularly where housing is inadequate and where there are many breeding sites for mosquitoes. High numbers of cases and deaths are found in conflict and post-conflict settings such as Democratic Republic of Congo and in countries with weak health systems such as Nigeria. However, we have excellent tools to control malaria such as long-lasting insecticidal nets, easy to use rapid diagnostic tests, efficient insecticidal sprays and effective treatments, in addition to an increase in funding for malaria programmes over the last few years. In Parliament the All Party Parliamentary Group on Malaria & Neglected Tropical Diseases has dedicated its energies to establishing the evidence and opportunities to tackle this devastating scourge by advocating, with authority, the need to highlight and prioritise this battle and win it – it is achievable with sustained effort.

Why, then, is the disease continuing to devastate communities? There are several reasons, and at present the main ones are that the systems to make sure these excellent tools reach the people who need them are very deficient. Lack of skills, lack of resources and sometimes lack of interest