



Water scarcity

A threat as big as climate change?

A report of the Business Forum
meeting on 24th January 2008

Contents

Introduction.....	1
Embedded water.....	2
Water stress in the UK.....	3
Global scarcity?	3
The business case.....	4
Market failures.....	5
Regulation, reputation.....	5
Big decisions.....	6
Coping with scarcity	7
Speaker biographies.....	8
About the Business Forum	9

Introduction

Farming is the world's biggest water user and, in some regions, the supply is drying up. Water scarcity will be one of the sharpest environmental, social and economic challenges of coming decades, and the food sector will feel this keenly.

The January meeting of the Food Ethics Council's Business Forum discussed how food businesses are addressing this challenge and what more they should do. The meeting was chaired by David Croft, Director of Conformance and Sustainability at Cadbury Schweppes and a member of the Food Ethics Council.

We are very grateful to our speakers, Tim Hess and Keith Weatherhead from Cranfield University. Tim Hess is Reader in Water Management and has extensive experience of research and delivering irrigation management training in the UK and Africa. Keith Weatherhead is Senior Lecturer in Water Resources and Irrigation, specialising in the impacts of socio-economic trends and climate change on water demand and resource availability.

This report outlines points raised during the meeting. Contributions are not attributed. The report was prepared by Tom MacMillan. It does not represent the views of the Food Ethics Council, the Business Forum or their members

Key points

- Irrigated agriculture accounts for around **70 percent** of all abstracted blue water.
- It takes anywhere between **1,000 L and 5,500 L** to produce the food we eat in a day, depending on our diet. By contrast, UK daily water use in the home averages 153 L.
- Yet the pressure food places on water resources depends where and how it is produced. The **impact** depends on more than just the quantity.
- Water stress, which is already a serious problem in the UK and globally, will be made worse by **climate change**.
- Water is already a survival issue for some food businesses and **commercial concerns** are driving water efficiency.
- However, business responses are not necessarily in the wider public interest and there is a risk food companies will simply **cut and run** from water-stressed regions.
- Embedded water is unsuited to labelling but there is an urgent need to standardise water **footprinting methods** businesses use for benchmarking and accreditation.
- Businesses should take part in wider social and policy debates about regulation, technology, land use and **dietary shifts** to mitigate water stress, and support the broader policy shifts needed to underpin better water management.
- **'No regret'** adaptation and mitigation measures are a priority.

Embedded water

Most of the water on the planet is out of reach to farming and other uses, in the oceans, the atmosphere or locked up in icecaps. Of the remainder, more than half is rainfall that only reaches as far as the soil, evaporating from the landscape (56 percent globally) or supporting rainfed agriculture (4.5 percent). This is known as ‘green water’. A further 37.3 percent of rainfall is lost to the oceans. Water management is most concerned with ‘blue water’ – the water resources held in rivers, lakes and groundwater that provide for irrigation (2 percent), and for cities and industry (0.1 percent). Irrigated agriculture accounts for around 70 percent of all blue water abstractions.

Producing food uses water. Each mouthful we eat represents a much larger investment of water in irrigation, washing, cooking and other aspects of production and processing. This investment is called ‘embedded’ or ‘virtual’ water.

For example, it takes on average 900 L of water to produce just one kilogram of maize. Many other foods are thirstier. A kilogram of wheat takes 1,300 L, eggs 3,300 L, poultry meat 4,000 L and beef 15,500 L.

It follows that different combinations of food – different diets – make different demands on our water supply. A basic survival diet accounts for around 1,000 L per person per day. A diet that ticked all the boxes nutritionally, without being lavish, comes in at 3,500 L. A Californian diet – higher in water-intensive products –

uses around 5,500 L. By contrast, the amount people in the UK use directly for daily tasks in the home, such as washing, averages 153 L.

Quantity and quality

Pressure on water resources depends on where and how water is used, not simply on the quantity. So, even though it takes more water to produce a burger than a bread roll, the wheat might come from a water-stressed region and the beef might come from rainfed uplands. So we cannot think of embedded water in the same way we think about embedded carbon. In fact, the impacts of water-use are more important than the quantity used. It is also important to consider opportunity costs – could we use the same water better, to support other human activities or to safeguard the ecosystems?

Water stress is about quality as well as quantity. Quality matters for at least three reasons. First, pollution, for example from leached pesticides or fertilizers, can render a water resource unsuitable for specific uses or damaging to the environment. Where cleanup is not possible this contributes to scarcity.

Second, scarcity can drive people to use water of declining quality. In agriculture and food production this can affect the quality and safety of the product. Water quality can affect the flavour of milk, for example, and irrigation with contaminated water has given rise to concerns over food poisoning. The use of poor quality water

for irrigation can also exacerbate the incidence of plant diseases.

However, third, it can also be a problem when people use water of higher quality than is needed for the task in hand. In agriculture, this might include using drinking water for irrigation. Regulations, supermarket standards or insufficient infrastructure may drive this problem.

Of course, too much water can also cause difficulties, as we have seen in recent flooding. The struggle for farming and the food sector is not simply to cope with scarcer water but also with greater volatility in the supply as climate changes.

Water stress in the UK

Water stress is already a problem in the UK. Much of the south and east of England is already seriously water stressed. In East Anglia, for example, licences to abstract more water in summer months are now only issued in a few places.

Climate change will exacerbate water stress. By 2020, it is expected that what farmers now call a dry year will have become a normal year. By 2050, what farmers now think of as an extremely dry year will be standard. By 2050, Bedfordshire will be as dry as the south of France is today. Some of the greatest challenges farming and the food sector will face in adapting to climate change will be in water management.

While agriculture is the biggest water user globally, in England it accounts for less

than 2 percent of water abstraction. Farming abstracts less than water companies waste through leakage. Yet farming is nevertheless an important contributor to water scarcity. By contrast to leakage, for example, the water used in agriculture is taken up by plants and evaporates, rather than circulating immediately back into rivers, lakes and groundwater and remaining available for other uses.

Including embedded water, it takes 752 m³ of water to produce the food and other agricultural products that we each eat per year, on average, in the UK. This is equivalent to using all the country's green water. In practice, however, around two-thirds of this virtual water is imported. In effect, then, we are also exporting our demand for water and, potentially, water stress.

Global scarcity?

Globally, water resources are under heavy pressure. More than 40 percent of the world's population live in areas of water scarcity and stress, without enough water to meet their basic needs. The growth of agriculture has contributed to this, not simply by depleting water resources but also by polluting them. As major water users, agriculture and food supply are also heavily affected by water stress.

The pressure on water resources will grow as population and standards of living increase, highly productive irrigated land is taken out of agriculture, climate change alters weather patterns and crops are

grown for bioenergy. By 2050, 85 percent more water will be needed to feed a growing population and eradicate malnutrition.

Water resource experts predict that water stress will cause crises in many parts of the world unless urgent action is taken to improve water management, including in agriculture and food production. In addition, it is essential to improve access to water resources for sanitation and development. These are distinct but overlapping problems.

So water stress is already a problem in many parts of the world and it will become more acute. But is it a global issue? The causes and consequences of water stress are often international, since activities that depend heavily on water, such as agriculture and food production, are part of the global economy. Yet water stress is also very localised, inasmuch as the shape of the problem and its effects depend on the geology, ecology, land use, politics – and more – of particular places.

The business case

Water scarcity has already become an immediate and direct constraint on farming and food manufacture by major food companies in some parts of the world. This is not just an issue facing marginal farmers – major global companies have had plants within days of closure due to drought.

So water management is already a survival issue for some food businesses and

farmers. It is likely to become a more important factor in decision-making for others. In January 2008, the UK Food and Drink Federation launched a five-step water-efficiency commitment. Although that initiative concerns companies' own operations, forward-looking food companies are also seeking to improve water management among their suppliers, for example by sharing best practice.

Some farmers and food companies have already made significant improvements in water efficiency, driven primarily by commercial concerns, not just about the cost and availability of water but also energy and labour. UK agriculture includes many examples of good water management that deserve to be better known.

Retailers have a vital role to play. They currently promote some unsustainable practices, often for the sake of appearance. For example, higher levels of irrigation are encouraged in potato growing to reduce the incidence of common scab and improve skin appearance. In contrast, some retailers have started to push for greater water efficiency by building it into their sustainability requirements.

Businesses cannot resolve water problems alone – they need to collaborate with each other, with government and with non-governmental organizations. To some UK farmers, however, better water management seems like yet one more demand by government and campaign groups. The problem is knowing how to prioritise. Larger companies can take a

balanced scorecard approach, but that is harder for smaller players.

Market failures

Dealing with water scarcity is both an ethical issue and a business issue. Where do they align and where do they diverge? Do rational business responses to water scarcity help to address the wider environmental, social and economic problems tied up with poor water management, or could they even exacerbate such problems? Which problems will the market fail to address? Could commercial mitigation strategies give rise to new problems?

One concern is that businesses will cut and run from seriously water stressed areas. For example, retailers may source produce from alternative regions. While this could reduce their exposure to water-related costs and to reputational risks, it could also exacerbate environmental, social and economic problems in areas already suffering from water stress. For many marginal parts of the world, where natural resources and cheap labour are the key reasons that international businesses are there at all, industrial flight is a serious hazard. A more ethical strategy would be for retailers to work with their suppliers to promote sustainable water management.

What are the commercial incentives for businesses to take a longer-term approach, working with suppliers and communities in places that are water stressed? Some businesses – but not all – may see a long-

term interest in building capacity within their supply chains.

Labelling product water footprints seems unlikely to create a strong incentive. Embedded water is variable and you cannot easily generalise for similar products from different places or produced in different ways. It also overburdens consumers who already have many demands made on them at the point of purchase. Furthermore, if consumers did respond by choosing products according to their water footprints, it would simply pull the rug out from under suppliers in water stressed regions.

So, it seems unlikely that good water management will become a major differentiator in the marketplace for food products, except in concert with other aspects of sustainability. Nevertheless, there is urgent need to standardise the water footprinting methodologies that businesses are starting to use within their own operations.

Regulation, reputation

Corporate concerns about water are and will continue to be driven by their analyses of the risks they face – regulatory, reputational and to their supply chains.

Further regulatory and fiscal measures may be needed to make sure commercial mitigation strategies support the broader public interest. These might include strengthening and clarifying water entitlements. Privatising water resources might encourage greater efficiency within business, yet it risks putting water – a

basic need – out of reach to poorer people for drinking, sanitation and domestic use. There is also a need for existing regulations to be reviewed to address disincentives to sustainable water use – for example where they require potable water to be used when water of lower quality would be sufficient. UK policy makers should also consider whether food production should be a higher priority than it currently is within plans for managing scarce water.

Businesses are realising that they have to get involved in difficult policy discussions about better water management. They need to support regulation that makes it easier to manage water well, working closely with local, regional, national and international authorities. They need to act now to remain viable in the long term.

The level of reputational risk depends on whether there is widespread public concern about water scarcity. The issue is not currently at the front of consumers' minds when they are shopping for food. However, a drought or other event highlighting water scarcity could move it up the agenda.

Responsibilities for water management are complex. This complexity could shield businesses from reputational risks. Equally, however, it could increase their exposure, particularly because the media are likely to simplify the stories they report about water problems. It would be in the interests of the food industry to take lead on this issue and demonstrate that they are managing water resources responsibly, addressing ethical issues over and above their immediate commercial concerns, before water scarcity becomes a major public concern.

Big decisions

In mitigating water scarcity, society faces some big decisions – about land use, technology, safety margins, diets and more besides. Businesses need to recognise this and play a constructive part in policy and public decision-making.

Changing land use could help mitigate and adapt to water scarcity. We could bring more green water into food production – capturing more rainwater for agriculture – if we had less forest. But this comes at a cost, in terms of biodiversity, carbon sequestration, livelihoods and landscape values. Does society want this kind of change? How are decisions made about land use?

Technology might also offer solutions, yet can raise ethical issues in its own right. Water management technologies for irrigation – including dams – have a controversial history and drought resistant genetically modified crops, which have long been promised by proponents of transgenics, may not be socially acceptable.

We may face decisions around safety margins too. Could we recycle more lower-quality water for irrigation or would the risk of contamination by pathogens be unacceptable. Retailers and regulators err on the side of caution when it comes to food poisoning, but how should they weigh up that hazard to consumers against the hazards posed by water stress in food-producing regions? Is there also scope for greater innovation here, for example using ultraviolet light, instead of washing, to destroy some pathogens.

Perhaps the biggest question of all is around diets. Different diets make different demands of water resources. It is not as simple as ‘thirstier’ diets always being the worst, but we could certainly eat in ways that were less water-intensive. Some of the greatest water-savings could come from eating less meat and dairy, though a consumer-driven change in diet would not necessarily drive production towards the most sustainable production systems. This is a challenge facing rich countries like the UK, which already eat water-heavy diets, and fast-growing economies such as China and India where meat and dairy consumption is rising steeply.

Water scarcity may already be affecting diets globally, particularly for poorer people, as a contributor to rising food prices. Should governments and businesses seek to encourage eating preferences that are easier to sustain, for example through choice editing and promotion? It could be better for the environment and soften the blow from water-related constraints on supply. In doing so, it is crucial to consider the opportunity costs and address deeper-rooted water management issues, so water that comes out of food production is not simply diverted to other water-intensive uses that may be less important to society.

Coping with scarcity

Water is already scarce in many parts of England and around the world. Climate change will make it even scarcer. In mitigating and adapting to water scarcity, key challenges are to:

- Improve water management alongside other aspects of sustainable development – including social and economic objectives, as well energy efficiency and other environmental aims – rather than seeking to address it in isolation.
- Promote ‘no regret’ adaptations, which bring benefits even if water stress does not worsen.
- Prioritise adaptations that also mitigate water stress and climate change.

Agriculture and food production will need to change, perhaps radically, to address water scarcity. This should not daunt us. We should not forget how much has changed already in recent decades – farming and the food sector have undergone major shifts. In promoting sustainable development, businesses, government and civil society need to consider bold scenarios, not just incremental change.

Speaker biographies



David Croft is Director of Conformance and Sustainability at Cadbury Schweppes plc., where he is responsible for quality assurance, environmental management, health and safety and ethical trade practices in a global supply chain with around 40,000 suppliers. He joined Cadbury Schweppes as Director of Ethical Sourcing and Sustainability in June 2005, having previously worked for more than ten years at the Co-operative Group. He has contributed significantly through this work to the development of the UK Fairtrade market by launching new products and ranges, and by developing consumer awareness and marketing campaigns. He has been involved in numerous initiatives to improve supply chain standards within companies and across the food sector, and has engaged extensively with government departments and NGOs. He is a member of the Food Ethics Council.



Dr Tim Hess is Reader in Water Management in the School of Applied Sciences at Cranfield University. His research has focused on the measurement and quantification of water balances as applied to wetlands, rainfed and irrigated agriculture in both temperate and semi-arid environments. He was an Executive Council member of the UK Irrigation Association for over 10 years and has been responsible for delivering training courses in irrigation management both in the UK and with irrigated sugar estates in Africa.



Dr Keith Weatherhead is Senior Lecturer in Water Resources and Irrigation in the School of Applied Sciences at Cranfield University. He works mainly on water resources for irrigation, the impacts of socio-economic and climate change on water demand and resource availability, and adaptation to global change. He has contributed to methodologies for predicting future water demand and for assessing water needs for abstraction license allocation, and to the improvement of abstraction licensing policy and legislation in England. He is a former chairman of the UK Irrigation Association.

About the Business Forum

Ethical questions around climate change, obesity and new technologies are becoming core concerns for food businesses. We have launched the Business Forum to help senior executives gain expert insights into the big issues of the day. Membership is by invitation only and is strictly limited.

The Business Forum meets six times a year for in-depth discussion over an early dinner at a celebrated London restaurant. The forum members shape the meeting agenda.

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