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food ethics

Water

The ethics of efficiency

PLUS

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The Food Ethics Council challenges government, business and the public to tackle ethical issues in food and farming, providing research, analysis and tools to help. The views of contributors to this magazine are not necessarily those of the Food Ethics Council or its members.

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From the editor

It takes a mind-boggling 200,000,000 litres of water a second to grow the world's food. That's like gulping down the Amazon river – its mouth 80 km wide – day in, day out.

We cannot sustain our current water habits. In some places rivers and aquifers are sucked dry. In others there is still water but not enough to support ecosystems or people's livelihoods Where water is scarce injustice abounds.

Because irrigation uses 70 percent of abstracted freshwater, food is on the front line. As concern over water escalates, food production will be affected and blamed in equal measure. Big food companies are worried – water shortages already strain production in some regions, so they know there's more than reputation at risk. In the policy stakes, meanwhile, water scarcity is up there with climate change.

This year has already seen one big food initiative to save water, and more may well follow. Through the Federation House Commitment, led by the UK Food and Drink Federation and resource efficiency group Envirowise, the UK branches of firms like Coca-Cola, Kraft, Nestlé, PepsiCo and Cadbury Schweppes have pledged to cut their water use by 20 percent by 2020.

The commitment is welcome, but only a start. It applies to the signatories' own operations but not to their supply chains. These are much thirstier and the place where most food companies can exert the greatest influence on water use. To prove they take the problem seriously, the companies must extend efforts along their supply chains and be consistent across global brands. The sector has made a strong case for better water management and now it must follow through its own logic.

But what would good practice look like? Would it mean shrinking company and product water footprints, like carbon footprints? Is efficiency the answer?

To a point. Footprinting can capture the sheer scale of our water use and focus efficiency drives. But it also misses a lot.

For a start, water isn't carbon. Where and when you make your savings, and whether they come from rainfall or stored water, is vitally important. Quality can matter as much as quantity. It is the impact of embedded water that matters, not the amount.

A second challenge is to improve water management alongside other aspects of sustainable development. Footprints won't give us all the answers and too many footprints just leave a muddy mess.

Third is the danger that by solving one problem we cause another. Companies can reduce the strain they place water resources by supplying from somewhere wetter but, as with airfreight, that risks pulling the rug out from under vulnerable communities. Desalination – another strategy – may buy water at heavy cost in greenhouse gas emissions.

Then finally, having stressed the influence food companies can wield on water use through their supply chains, we must also see the limits. What are the opportunity costs of using water to grow food? Will we swap farms for golf courses?

These aren't just technical hitches. They reveal a deeper problem: footprinting isn't ethical. It's not *un*ethical either – it simply leaves the ethics of water use to one side, treating water problems as a technical challenge to be solved by better management and greater efficiency. Yet, as José Esteban Castro (p.7) points out, water is hotly political – the work of water engineers touches livelihoods, deep-rooted values and vested interests. Like hunger, water scarcity is a social and economic condition, not simply a physical one – rich people don't starve or go thirsty. Unless efforts to address water problems start with that fact, we duck the biggest issue.

So as well as technical tools like footprints, we need approaches to water governance built on sound ethical principles. A report for UNESCO by Lord Selborne (p.11) flagged up six such principles, including the right of "participation for all individuals, especially the poor", "human equality", "the common good" and "the principle of stewardship". It also questioned the instrumental view that water management is simply a means to human ends, suggesting we rekindle a "sense of the sacred" in water.[1]

What does water ethics mean in practice, for consumers, governments and food businesses? It shows consumers are in a fix. We can eat less thirstily but we can't do much about the opportunity costs. Purchases that make us feel good may have perverse consequences. As the UNESCO report suggests, the bigger challenge is to act like water citizens, not just as water consumers. We need to think about water at the polls and in our communities more, perhaps, than when we're shopping.

Governments need water policies that guarantee basic entitlements and universal access, and support priority uses. What counts as a basic entitlement and which uses are a priority (how much is allocated to food production and to support ecosystems, for example) are questions of value – they are ethical debates that must be held openly. Policy efforts must be international, because it is as easy to export drought as to import embedded water. They must also inform innovation, energy, agricultural and public health policies. As contributors to this magazine discuss, biofuels, soil organic matter, the balance between rainfed and irrigated farming and, of course, diet, are all bound up with water management.

Finally, what should food businesses do? First, support policies that improve water governance across the board – actively debate the winners and losers, the value of water to society and the other aspects of water use that get us beyond the 'litres per kilogram' footprinting mindset. Second, it follows, don't label embedded water – if water has a place on labels, it is within wider accreditation for sustainable production. And third, as a priority, engage with the communities that supply and consume your products. Partly this is pragmatic – moving to more sustainable production models, without cutting and running from water stressed areas, means bringing producers and consumers with you. Yet it is also crucially about ethics – how else can we really know what a better future for water should look like?

Tom MacMillan
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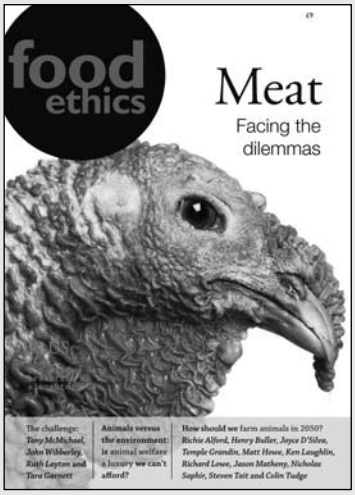
[1] Selborne, J (2000) *The ethics of freshwater use*. UNESCO-COMEST, Reykjavik.

letters

If you want to respond to any of the articles in this issue or raise a different point, please write us a letter. Our contact details are on the contents page.

Meat's carbon emissions – a lot of hot air?



Sir; Tara Garnett (Winter '07) is too polite about the Food and Agriculture Organisation's claim, in its 2006 report Livestock's Long Shadow, that 18 percent of the world's greenhouse gas emissions are attributable to meat. She says the figure is high (compared to her own figure of 8 percent for the UK) because in the developed world a higher proportion of emissions come from fossil fuel burning for transport, industry and heating. This is true, but people in the developing world also consume less animal protein than we do and the means by which the FAO assigns such a disproportionate level of greenhouse gas emissions to those who do not get the lion's share of the meat deserve more scrutiny.

The main way they do this is by including figures for carbon emissions from Amazon deforestation – a grave problem, but one which most analysts put to one side because it distorts the picture. Why? It is unclear how much deforestation is directly due to beef; emissions from deforestation reflect expansion, not production (that is they are a capital cost, not an annual cost); and about 99 percent of the world's meat and dairy produce does not come from the Amazon and hence, by the FAO's account, is only responsible for 12 percent of global greenhouse gases, or 13.5 percent if you include Amazon soya.

There are other reasons why the FAO's figures for methane and nitrous oxide emissions should be viewed with caution, which I have outlined in articles published elsewhere (tinyurl.com/2d88df and www.tlio.org.uk). The main issue is that the policy arm of the FAO is by no means ideologically disinterested, but for years has been targeting what it regards as inefficient peasant farming. In 1998 Henning Steinfeld, principal author of Livestock's Long Shadow, wrote: "We cannot afford the common nostalgic desire to maintain or revive mixed farming systems with closed nutrient and energy cycles... To avoid overuse of immediate natural resources, mixed farmers and pastoral people alike need to substitute them with external inputs. The trend of further intensification and specialisation is inescapable. Attempts to change the direction are "doomed to failure."

In my view the authors of Livestock's Long Shadow attribute to extensive agriculture the highest level of emissions they feel they can get away with, not to persuade people in the north to reduce their excessive meat consumption, but to support their contention that meat consumption should double through the adoption of intensive and industrial production methods.

Simon Fairlie
Chapter 7
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Less meat or no meat?

Sir; the fundamental and most challenging ethical question regarding eating meat is not whether it should be done more sustainably, consumed at decreased rates, or even whether animals should be treated more humanely. It is whether animals should be raised and killed to be eaten by humans at all. This dilemma was not much addressed in the latest issue of Food Ethics.

Since ethical thinking requires subjecting one's views to critical scrutiny, we should remember that none of the common defences of eating animals pass critical thinking. Is it moral to eat chickens, pigs and cows because they can't reason abstractly and lack concepts of right and wrong? Many humans are likewise unable, but we recognise that eating them would be wrong. Is it because (some) animals eat other animals? Surely animals should not be our moral exemplars. Is it because of tradition, and that money is to be made from it? But not all traditions and employments are moral either. And insisting that animals have no rights needs defence if it is to be anything other than a statement of the assumption that it's moral to kill animals for food.

Ethics sets forth an ideal. When this ideal is defended with impartial moral reasons, it's hard to see how raising and killing animals for the pleasure and convenience of eating them is ethically defensible. Animals raised for food are, like us, conscious, feeling beings whose lives matter from our points of view. Like us, they too should not be eaten.

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CAP needs an ethical foundation

Sir; the Common Agricultural Policy (Autumn '07) has never had a nutritional component, it does not have one now and, from the reform proposals currently on the agenda, it will not have one for the foreseeable future.

Which is to say, CAP has no ethical foundation. The fundamental purpose of farming is to provide the food that people need to eat. CAP has never incorporated this basic point.

Recently, omission has turned into aggression. The long-delayed 'reform' of the sugar regime reduced the price of sugar by 36 percent – in the midst of an obesity epidemic! A policy for malnutrition.

Even at previous EU prices, sugar was a cheap ingredient for food and drink manufacturers. The cut will encourage them to use more in processed products, our main sources of sugar these days.

The global obesity epidemic forms the health context in which the current reform of CAP is taking place. Yet most proposals concentrate on increasing other 'public benefits' – animal welfare, environmental protection, rural development, sustainable production. And that includes, with two honourable exceptions, most contributors to the Food Ethics special issue on CAP.

It is time to use CAP to enhance basic nutrition – to discourage production of foods we want people to eat less (fatty, sugary) and to encourage production of those people should eat more (vegetables, fruits, fibre). If so, then (to quote a favourite food industry slogan) agriculture will be part of the solution for obesity, not part of the problem.

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Are we exporting drought?

The problem and promise of embedded water

Jacob Tompkins

A few weeks ago the UK Food and Drink Federation and Envirowise launched the Federation House Commitment. Pledging environmental improvements in the food and drink sector by 2020, the commitment covers a range of issues, from packaging to carbon and water. It is backed by the big names in the food and drink sector and is very welcome. The water commitment pledges to cut process water use by 20 percent by 2020 – that's a lot of water saved in the UK. But if you consider the amount of water embedded in products, it's a drop in the ocean. Welcome to the concept of embedded, embodied, shadow or virtual water. Put simply it is the water used to produce a product.

Water may not be a globally traded commodity, but there are huge daily fluxes of water moving around the globe in the goods we consume. It takes water to produce everything we use, clothes, shoes, car, computers and especially food. The amount of water required to produce food is astonishing – it takes 200,000,000 litres per second to grow food for the planet. Even though most of this food production is rainfed we still use 70 percent of global freshwater abstraction for irrigation.

This is worrying. Rainfall patterns will change as the climate changes, so we can't rely on nature to irrigate our unnaturally large plantations, and our insatiable desire for any crop at any time will continue to grow. Both these drivers mean more irrigated land, which in turn means less available water for the environment and human use, particularly in areas of water stress where there is often a cheap labour market. So we'll get cheap bunches of supermarket flowers and packets of mange tout, subsidised by sub-Saharan subsistence farmers or low income urban families denied access to water.

On top of this biofuels are starting to affect the economics of agriculture and resource use, and at 1,000 litres of water for 1 litre of biofuel, they are already having a big impact in driving up water use.

So does the UK have an influence in terms of driving demand for embedded water and can we help to reduce this demand? Are we exporting drought?

Agriculture in the UK is not a great user of water, accounting for less than 5 percent of consumption. But this is growing, and in many parts of the UK there is increasing tension between the needs of agriculture, domestic supply and the environment. In places like the Isle of Wight or East Anglia businesses have been prevented from expanding due to a lack of available water, forcing them to relocate. On the face of it, the environment is being protected and businesses are moving to areas where water is less stressed – except they aren't. They are moving to places with less stringent regulation, resulting in tomato production in the Isle of Wight shifting to Spain, Portugal and even Morocco. Absurdly, although we are protecting the water environment in the UK, we are also losing rural jobs, exacerbating drought in already arid countries and dramatically increasing food miles.

> There are huge daily fluxes of water moving around the globe in the goods we consume

In this complex issue it's tempting to use water as a champion for protectionism, but instead we should start looking at global flows of embedded water.

Unfortunately we can't just assess the amount of water in products, then stick water labels on food for consumers to make informed decisions. The answer is not that simple, as you will see in the rest of this magazine. There are a lot of questions about how we should deal with embedded water.

For a start we need to apportion blue (abstracted) and green (soil) water; assess the impact of blue water; and offset the benefits accrued from using water.

Put simply, embedded water means that every time we consume, we are drawing water from across the globe. Figures produced by Chapagain and Hoekstra for UNESCO estimate that in the UK we consume around 3,400 litres a day in embedded water. In some cases these fluxes can be a good thing, where flood water is used to irrigate crops, or where water is readily available and its use creates income and employment. In other cases it can be very detrimental. Consuming crops that have been grown in water scarce regions denies access to water for local communities and damages the local environment. There's no denying that agriculture affects the environment – for good and bad – but overabstraction of water for irrigation can cause environmental damage on a global scale.

Cotton production around the Aral Sea is the most stark example, where a whole sea has been decimated and the regional and global environment has been affected. Current water consumption in parts of Spain, California, China and East Africa are heading for the same ecological and social disasters, driven in part by the contents of shopping baskets in the UK.

But although embedded water is a global problem of epic proportions, it may also offer a solution. Water is too heavy to import in bulk and, unlike energy, there is no substitute for water. But if one tonne of wheat contains 1,300 tonnes of water, then a water scarce region can import 1,300 tonnes of water by importing 1 tonne of wheat. So if China looked at the option of importing water in goods the absurd folly of the South-North water transfer may disappear.

Continued on next page...

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But because food security and self-sufficiency are highly political issues, Governments are unwilling to asses or discuss embedded water. Likewise most large multinational corporations have not yet embraced the concept of embedded water, due to the complexity of the problem, lack of political or consumer pressure, and the fact that they are already struggling with assessing the carbon issues in their supply chains.

Switch your potato variety from water guzzlers like Maris Piper to drought resistant varieties like Desiree

It is clearly time for embedded water fluxes to be assessed at a global level and it must be done internationally. There needs to be recognition and discussion of the issue. Then there needs to be an international agreement on the value of water and how abstraction should be monitored and apportioned. The European Water Framework Directive is the closest we have to an international framework for water management but it is flawed because each Member State has at least one set of legislation covering abstraction rights. And whilst the Directive considers cross-boundary fluxes of groundwater and rivers, it does not consider fluxes of water in goods. This leads to situations where the UK exports drought by importing tomatoes, whilst Spain toys with the idea of a national water grid which would cause massive environmental damage. Despite this, Europe has the best system of water management of any region – but look at global transfers between regions and the situation is much worse.

Embedded water means that our food consumption and production is devastating the world's fresh water resources. It's time to do something about it.

If the best solution is global, then how do we move towards this, and what can we do as individuals?

At an individual level, ask questions about the water in the food you buy. But beware implications for jobs in the developing world associated with shunning embedded water. Probably the simplest action is to switch your potato variety from water guzzlers like Maris Piper to drought resistant varieties like Desiree. This has an immediate impact on water use in the UK and will reduce pesticide levels. If your shops don't stock Desiree ask why not. Or if you really want to reduce your water footprint, think about the meat you eat and where it comes from. Beef is probably the most water intensive product in the world! By asking questions we can help push business to do the right thing and get water on their agendas.

At a national level, the UK should take a lead on this issue. As major water consumers our actions have an impact across the globe, so the UK government should develop a policy on embedded water and work with other members states to do the same at the EU level linked to the Water Framework Directive.

The UN Environment Programme is starting to look at this issue but is not getting much support from nation states; hopefully we can all help influence that.

Water ethics

A better way to good governance

José Esteban Castro says it is time water policy got political…

As a world, we don't use water very wisely. In many areas, poor water management sees water users suck their future out from under themselves, wreaking havoc on the environment and stirring up social conflict. To tackle this properly do we need a universal water ethic?

Since the 1970s, the international community has launched a host of initiatives to make water management fair and ecologically sustainable. They have targeted desertification, water pollution, water conflicts, floods and other disastrous climatic events, water-related diseases, and shortfalls and inequalities in the allocation and distribution of water for essential human use.[1] Despite all these important efforts, the struggle to manage water better is being lost in many countries.

Freshwater is pushed and pulled by contradictory forces – more and more is needed for human use, yet abstraction needs to slow down if we are to restore and protect fragile ecosystems and water bodies.

Ecological problems

Water use for agriculture poses a special challenge. Even before the extra demand from biofuels, the UN Food and Agriculture Organisation (FAO) forecasted that developing countries will need an average 14 percent more irrigation water by 2030.[2] While FAO doesn't see this restricting overall availability of freshwater, environmentalists argue that water abstractions need to fall if they are to become sustainable.[3]

The critics point to dramatic examples such as the Dead Sea and the Aral Sea in Central Asia, which have shrunk to a fraction of their original sizes as a result of large-scale irrigation and water-intensive industrial activities. These are just two examples in a long list of dying rivers, lakes, aquifers, wetlands and water bodies.

Irrigation does not happen in isolation. Freshwater resources are subject to competing demands from rising urban living standards in developing countries, the expansion of tourism in water-scarce regions, or the growth of shrimp farming and other forms of aquaculture, to mention just a few areas of concern.

In this context, it is difficult to foresee how we could possibly achieve – simultaneously – food security and sustainable water management.

Water insecurity

The social injustices that surround water use underline even more boldly the need for a global water ethic. Large swathes of the world live and die without enough water to meet their basic needs, or in fear of water shortage.

The international community has failed to meet its goal of universal access to essential volumes of clean water and basic sanitation. This goal was restated in the late 1970s, when the aspiration to provide essential volumes of safe water to all by 1990 – 40 litres per person per day – was endorsed by the United Nations. The 1977 UN Water Conference in Mar del Plata, Argentina, which led to the International Drinking Water Supply and Sanitation Decade (1980-1990), declared that everyone has "the right to have access to drinking water in quantities and of a quality equal to their basic needs".[4] The Decade was officially closed by the Global Consultation held in New Delhi in 1990, which produced the New Delhi Statement calling for "some [water] for all rather than more for some".[5]

Despite significant progress in some areas, these commitments have met spectacular defeat. At the start of the twenty-first century, 1.1 billion people (around 17 percent of the world's population) still lack access to safe water while around 2.4 billion (40 percent) lack adequate sanitation.

Indeed, the tenacity of water insecurity has seen old ambitions downgraded. In 1990, the aim had been to guarantee universal access to essential volumes of water. The current targets expressed in the UN Millennium Development Goals (MDGs), adopted in 2000-2002, only seek to halve the proportion of people

Continued on next page...

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without access to these services by 2015.[6] The new goals may seem more 'realistic' but they are ethically suspect – can the international community really accept that a large proportion of human beings will continue to suffer preventable disease and death for the foreseeable future?

Unfortunately, the likelihood of this bleak water future is confirmed by the evidence emerging from recent evaluations of the progress towards the MDGs. They show that even these limited objectives will not be met in many of the world's poorest countries.[7]

Moral conflicts

There is growing recognition that the roots of this unacceptable state of affairs are not simply technical or 'natural' but rather, broadly speaking, social and political. They stem from a "crisis of social responsibility"[8] or, as the latest UN World Water Report puts it, "a crisis of [water] governance".[9]

The current efforts to improve 'water governance' show up the deep-rooted moral conflicts that have dogged efforts to achieve a universal water ethic. It is a debate fought between rival intellectual and political traditions, defending often irreconcilable principles, values and interest groups.

The fact is that good water governance means different things to different people. For some, water governance is an instrument, a means to achieve certain ends. They see it as an administrative and technical toolkit that can be used in different contexts to reach a given objective, such as enforcing a particular water policy like full-cost recovery or the privatisation of water sources and services.

For others, good governance is a democratic process, where alternative, even rival, development projects are debated and refined. They see it as crucial to explore competing values, interests and claims to the common good, rather than assuming that the ends are obvious and that working out the best means to achieve them is just a technical matter.

This difference runs to first principles. Some see water as a common good and essential water services as a public good that cannot be governed through the market. Others take the quite opposite view – that water is primarily an economic resource, essential water services are a private good and a commodity, and so the governance of water and water services must centre on free-market principles.

Silent politics

For now, technocrats rule the roost. For all the debate about water ethics, an instrumental view of water governance prevails – as a technical, managerial challenge, not a political one. In practice, though, the politics get hidden rather than eliminated.

For instance, a recent World Bank-funded study produced several recommendations for the reform of water institutions worldwide, claiming that "the main objectives are rather transparent… to: make water as an economic good, strengthen allocation capabilities, increase the reliance on market forces, revive the payment culture, ensure financial self-sufficiency, promote decentralised decision structure, and encourage the adoption of modern technology and information inputs".[10]

Leaving aside whether these objectives are right, this raises a barrage of ethical questions. Who decides the objectives for water reform – for whom are these objectives "transparent"? How are these decisions taken? What part do water users play in this process – are they consulted and how else can they get involved? What are the ultimate ends and values that underpin such objectives?

That study is just one illustration of the contradictions running through the prevailing technocratic approaches to water management. A highly political project to reform water institutions worldwide is presented as a neutral, "transparent", policy instrument.

Today's crucial decisions about water – whether over large dams and ambitious interbasin water transfers, or over the privatisation of essential water sources – continue to be taken and implemented with complete disregard for the interests and values of the vast majority of the world's water users and citizens.

Water democracy

Democratic water governance makes more sense. It is grounded in the view that "the core of governance has to do with determining what ends and values should be chosen and the means by which those ends and values should be pursued".[11] Governance cannot be reduced to an instrument for the implementation of policy decisions taken by experts in the relevant fields.

Governing water is inevitably political and it is nonsense to pretend otherwise. Admitting so brings conflicts over values and material interests into the open, where they can

be scrutinised and sometimes resolved, instead of brushing them under the carpet. Democratic water governance raises the same questions as technocratic approaches – who decides, how, and so on – but, unlike a technocratic approach, comes with in-built ways to answer them. It puts ethics at the heart of decisions about water, instead of on the periphery as a distant ambition.

Towards a universal water ethic

Leading the welcome backlash against technocratic approaches to water governance are calls for a universal water ethic – calls that are getting louder.

In 2000, a UN working group produced a brief report on The Ethics of Freshwater Use highlighting that the debate on water ethics was directly linked to wider debates on universal ethical principles, in particular "human dignity", the right of "participation

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for all individuals, especially the poor", "solidarity", "human equality", the primacy of "the common good", and "the principle of stewardship".[12]

Then, in 2005, a group of over 100 European water experts further emphasised the need for universal ethical principles to underpin global water management, calling for urgent measures to sustain "the universal principle of respect for life". They argued that "rivers, lakes, springs, wetlands, and aquifers must be considered as the Heritage of the Biosphere", and that principles for democratic and sustainable water management should be given priority over all other considerations.[13]

There have been other, similar initiatives in developing countries where technocratic governance and the unchecked privatisation of water management are coming under increasing fire.

These are important moves that the international community should welcome. They offer a surer route to managing agricultural and other conflicts over water, and to water security. It might even mean we start meeting those targets.

[1] See Milestones 1972 - 2006 at www.unesco.org/water/wwap/milestones/index.shtml.

[2] Bruinsma, J (2003). *World agriculture: towards 2015/2030.* Earthscan, London.

[3] Brown, LR (2005) *Outgrowing the earth.* W.W.Norton & Co. London.

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[5] United Nations (1990) *The New Delhi statement.* UN and the Government of India, New Delhi.

[6] United Nations (2000) *Millennium declaration.* UN, New York. United Nations (2002) *Key commitments, targets and timetables from the Johannesburg plan of implementation.* World Summit on Sustainable Development, UN, Johannesburg.

[7] World Health Organisation (2005) *Health and the Millennium Development Goals.* WHO, Geneva.

[8] Ward, C (1997) *Reflected in water: a crisis of social responsibility.* Casell, London.

[9] UNESCO (2006) *Water: a shared responsibility.* UNESCO and Berghahn Books, Paris and New York.

[10] Saleth, RM, and Dinar, A (1999) *Evaluating water institutions and water sector performance.* World Bank Technical Paper 447, Washington DC.

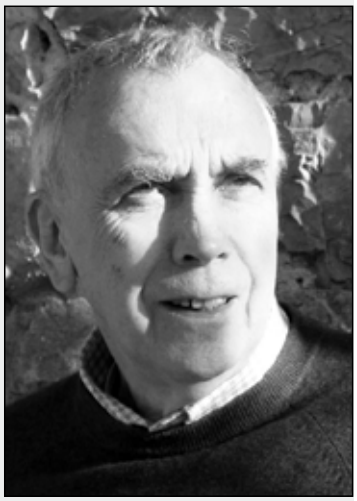
[11] Hanf, K and Jansen, A-I (eds.) (1998) *Governance and environmental quality.* Addison Wesley Longman, Harlow.

[12] Selborne, J (2000) *The ethics of freshwater use.* UNESCO-COMEST, Reykjavik.

[13] EUWATER (2005) *European declaration for a new water culture.* New Water Culture Foundation – EUWATER Network, Saragossa. www.unizar.es/fnca/euwater

Is our food too thirsty?

We ask leading experts on food and water scarcity, and people who are doing something about it...



Tony Allan

Around 90 percent of the water we consume is used to produce food, so what we choose to eat is important.

It takes about 1,000 tonnes (cubic metres) of water to produce a tonne of wheat, but 16 times as much to produce a tonne of beef. Eating wheat products is an efficient way to use water, but using wheat, corn or soya as fodder for livestock is not. People in North America and Europe consume about five cubic metres of water per day from water resources. Poor people in the South survive on about one cubic metre per day. In China it is about two cubic metres per day.

There is enough freshwater locally – with a few exceptions – to meet the current and future needs of the world's economies when it comes to household and industrial use in urbanising societies. But there may not be enough water in the global hydrological systems to produce our food. The world's population will be levelling off by mid-century, but new agricultural demands, for biofuel for example, will impact on water security.

We face some tough personal and political choices. Two of the biggest variables in water use are population and diet. China's population policy has taken the water demand of between 300 and 400 million people out of their own and global systems – as many as live in the Middle East, Europe or the United States – and we have benefitted. India's water consumption is low because of its vegetarian food culture. Are policies on diet more or less intrusive than population policies? Does water security call for both?

Tony Allan is an international expert in water resources, water policy and its reform. He has retired from teaching, but continues to be an active member of the SOAS-King's College Water Research Group, which he founded. www.soas.ac.uk

Tim Lang

Foods vary enormously in the amount of embedded water they contain or represent. Meats and animal products are water-intense, but crops like rice are fantastically heavy users of water too, as are some horticultural products.

Three things are certain. First, water is essential for all foods – for growing, washing, processing and cooking. Second, global water stress will increase. Third, water auditing of food is going to come. Already, processors and farmers watch water bills. As carbon equivalent and greenhouse gas assessments are rapidly being developed, so will audits of food's reliance on water.

Water-stress is deemed a developing country problem, irrelevant to wet Britain. But as climate change highlights the superficiality of national boundaries, so the world's looming water crisis will recast our mental maps on food and water. As home-grown food production slides, we buy others' water, labour and land.

With water systems that were public now privately owned, water governance suffers from 'lock-in'. Company interests shape policy yet costs are pushed onto consumers. An institutional architecture exists which sees water as a single issue, when it should be woven into other issues like land, housing, food, amenities.

Democratic oversight is thin – why should Ofwat bother about four litres of embedded water in a Kenyan green bean stem? Or 2,400 litres embedded in a hamburger? The emerging water-in-food economy requires tight lifecycle assessments, and buy-in by everyone in the food chain. This is not yet on the policy map, but will have to come. The question is: under crisis or anticipated conditions?

Tim Lang is Professor of Food Policy at City University's Centre for Food Policy and Natural Resources Commissioner on the UK Government's Sustainable Development Commission. He is writing in a personal capacity. www.city.ac.uk

John Selborne

Lord Selborne is a member of the House of Lords Select Committee on Science and Technology and chaired its report on Water Management, published in June 2006. www.parliament.uk

Farmers around the world rarely pay the full economic cost for irrigation water. Governments understandably take the view that food security is a high priority and allocate a generous proportion of their water supply to farmers for food production, at a cheaper rate than to other sectors.

In Australia 70 percent of available water is used for irrigation, yet much of this is used on low value crops at a time when the country's economy is threatened by water shortage. In New South Wales half of all irrigation water is used on pasture.

Global water demand is increasing through population pressure and increased industrialisation, but attempts to re-allocate water rights from low value agricultural production systems to higher value crops or to other sectors can be difficult to achieve.

Across England and Wales agriculture uses 1.1 percent of all water consumed, but in some areas at peak times of the year, it accounts for up to 70 percent of total abstraction. It seems reasonable to predict that agriculture will find itself having to justify high water consumption against competing demands as the EU Water Framework Directive comes into effect.

Any successful method of water allocation and management must be based on the natural hydrological system, the river basin, and in England the Environment Agency has powers to buy out irrigation rights where they are considered unsustainable. This means that as competing demands for water increase, agriculture will be forced to concede some of its water rights, and farmers will be forced to adopt more efficient methods of irrigation.

Number crunching

By 2025 an estimated 1.8 billion people will live in water scarce areas. We use between 65 and 70 percent of the world's abstracted water to grow food for the planet – around 200 million litres of water per second. People living in rich countries eat around 5,000 litres of 'embedded' water per day, while those in poor regions subsist on 1,000. A vegetarian consumes around 2,000 litres of water per day and a meat-eater clocks up 5,000 litres. A pork chop accounts for 2,000 litres of embedded water, and a portion of green beans from Kenya around 80 litres. A portion of rice contains 100 litres and, if you wash your meal down with a glass of milk, that adds another 1,000 litres.

Liz Barling

Wenonah Hauter

Industrialised agriculture abuses water resources through a cycle of overuse, waste, and pollution. Irrigation accounts for 65 to 70 percent of world water use. In the United States, over 100 trillion litres are used annually to irrigate cropland and, in the 18 states dependant on irrigation, 70 percent of stream and river water is depleted. One of the largest aquifers in the world, the Ogallala, which underlies eight states, has been seriously depleted by irrigation and may be dry in 25 years.

Factory farms that raise animals deplete and pollute water. Each cow in a dairy factory uses 682 litres of water per day. A 10,000 animal hog factory uses 189,250 litres of water each day – just for drinking. Factory farms depend on the availability of cheap corn, a very thirsty crop that requires the heavy use of polluting herbicides and fertilisers. One acre of corn requires 1,892,500 litres of water and a pound of meat produced by a corn-fed animal requires approximately 5,677 litres of water.

We need farm policies to support family-operated, diverse farms that provide food locally and regionally. This means not only removing the subsidies that benefit multinational corporations that want cheap commodities, but also reinstating policies that stop the overproduction of crops. Consumers can help the planet and improve their health by choosing to eat foods grown as locally as possible and by eating low on the food chain.

Wenonah Hauter is executive director of Food and Water Watch, a non-profit consumer organisation that works to ensure clean water and safe food. www.foodandwaterwatch.org

Is our food too thirsty?

Jeff Rooker

While there is no denying that the production and processes involved in getting food from the farm to the plate consume large amounts of water, it is important to remember that as well as the use of water for crop irrigation and livestock husbandry, a significant amount of water is also used in the cleaning, handling and manufacturing of food products.

But, it would be wrong to focus on a single issue, such as water, when what we want to do is improve the overall sustainability of the food chain, and reduce the largest impacts where they occur. For some food products, water may be the largest impact and one we need to focus on, but there are a range of other environmental impacts to consider.

The Food Chain programme has been set up by Defra to identify and reduce the impacts of the food we produce and consume in the UK, including on water and greenhouse gases. Additionally, following the publication of the Food Industry Sustainability Strategy, the food industry announced a partnership initiative led by the Food and Drink Federation, with the Government funded Envirowise programme, which aims to reduce water usage by 20 percent by 2020 from a 2007 baseline.

Lord Rooker is the UK government minister for Sustainable Food, Farming & Animal Health.
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Maite Aldaya and Ramón Llamas

Yes. Globally, more water is used in food production than in other sectors, accounting for 70 percent of freshwater use, and an even higher percentage in arid and semi arid countries. But even though water resources are unevenly distributed and, in some regions precipitation and drought conditions are increasing, the crisis is one of water governance rather than water scarcity.

Today, most water experts admit that pressures on water are mainly due to poor water management, corruption, lack of institutions, bureaucratic inertia or low investment. This problem affects rich industrialised and poor developing countries alike, but it is usually the poor who suffer most.

Scientific and technological advances in the last half century, however, have produced tools to solve many water related problems that a few decades ago seemed unthinkable. Desalination can turn salt water into fresh water suitable for urban supply; virtual water, embedded in agricultural commodities can be 'exported' from water rich countries to irrigation based poor economies, encouraged by the low cost and speed of food distribution; and cheap and easy groundwater abstraction – the silent revolution – has produced great social economic benefits, providing drinking water and reducing hunger, esp cially among the poor. These advances are helping to ensure global water supply and water-dependant food security.

We have enough fresh water to produce food for the global population now – and in the future. But world leaders must take action now by embracing transparency, removing perverse subsidies and making WTO agreements fairer.

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tinyurl.com/2umw5w

Nick Reeves

I was spooked by a UN report I read the other day – it seems that global crop production is not keeping pace with population growth. By 2050 there will be roughly nine billion souls in the world. To feed and water them, and meet our millennium development goal on hunger (to halve the proportion of hungry people) we would have to increase world food production by 100 percent.

The fact is, unless we reverse population growth, and cut waste, overeating, bio-fuels and meat consumption, demand for cereal crops could rise to three times the current level.

We will also have to double water use on crops by 2050. But water scarcity is acute in many parts of the world, and farming takes the lion's share from rivers, streams and groundwater, so where will this extra water capacity come from?

Water waste and embedded water in food is rising. Ten percent of the world's major rivers no longer reach the sea all year round. Water scarcity is a worldwide problem exacerbated by a consumer culture of buying what we want, not what we need.

An estimated 1.8 billion people will live in regions with absolute water scarcity by 2025, and two-thirds of the world population might suffer water stress. Water wars could escalate into global conflict. Climate change will see rainfall decline most in places in greatest need of water. So how, unless there's a sudden decline in carbon emissions (or population), are we going to feed the people of the world?

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Míkel González Ateka

Yes. In the province of Malaga, in the south of Spain, and more specifically in the valley of the Guadalhorce, where I live, we are in the third year of an intense drought. In fact, it has not rained in a whole year. Our valley has approximately 10,000 ha, of irrigated land and the crops grown there – mainly citrus fruits – have only received six irrigations in the last three years. The upshot of this is that a vast number of trees have died, condemning local farmers to abandon their livelihoods. In areas with greater water availability than ours, over-use is leading to aquifers becoming salty and useless.

Our regional agriculture of olive, almond and citrus trees, is suffering badly, with yields reducing by as much as 50 percent. Meanwhile, in and around the Costa del Sol, there are more than 50 golf courses, thousands of hectares of gardens, and massive consumption by the inhabitants – residents and tourists – of the region. Between them they consume almost 500 litres of water per person per day.

In effect, there is water for the tourist industry but not food production. The Spanish government and our citizens urgently need to decide whether our water should be used to maintain a tourist industry that is already threatened by the world economic crisis, or for food production in one of the best agrarian zones of the planet. I know which I'd choose.

Míkel González Ateka farms organic vegetables and olive trees in southern Spain, and campaigns on food issues including food sovereignty. He is married with two children.

Lyla Mehta

Perhaps, when you look at how diets have changed. Meat, milk products, sugar, oils and exotic vegetables require more water and different management practices than staple crops and cereals. Urbanisation and lifestyle changes will increase demand for water-hungry food.

Agriculture already uses 70 percent of the world's water. Population increases, pollution, depletion of river and groundwater resources, closed river basins, impacts of climate change and competition between farmers, cities, industry and nature all exacerbate access to water for food.

However, there is enough water and food to go around our planet. The UN's Food and Agriculture Organisation data reveal a surplus of food, rather than a shortage, in relation to total global population. And sociological and political attention to realities on the ground almost always attributes water shortage not to absolute or physical scarcity, but to socially-generated scarcity arising from imbalances of power denying people access to water. These include: unequal gender relations, ethnic and racial discrimination, ill-defined water rights and unequal access to land and resources.

Water scarcity is a multifaceted phenomenon and solutions cannot be simplistic. Governments and policy makers have historically focused on large-scale irrigation, which despite benefits, has high environmental and social costs. Attention should be turned to rainfed areas, where most poor people grow food, and to increasing the productivity of water used in crop, aquaculture and livestock systems to reduce 'blue' and 'green' water needs. Water justice is required for the world's marginalised and poor and we can also cut our consumption of water-hungry food

Lyla Mehta is a Research Fellow at the Institute of Development Studies at the University of Sussex and the author of The Politics and Poetics of Water. www.ids.ac.uk

Is our food too thirsty?

Johan Rockström

Food production is one of the world's largest freshwater-consuming economic sectors. An adult on an adequate diet consumes around 1,300 m3 per year, equivalent to over 3,000 litres a day.

Conventional wisdom has agriculture consuming 70 percent of the world's freshwater withdrawals. That 'wisdom' only looks at a small portion of the total freshwater used for economic biomass production (for food, timber, fodder and fibre); namely the use of water for irrigation. Yes, it does cause major problems, with rivers running dry, leaving less freshwater to sustain downstream cities and aquatic ecosystems. However, "blue" water actually only amounts to a fraction of global water use for food. The bulk of global food (60 – 70 percent) is produced using "green" water (infiltrated rainfall, forming soil moisture in the root zone, on its way to evapotranspire in support of biomass growth).

Our estimates show that global blue water consumption in irrigation is approximately 1,800 km3/yr, while rainfed agriculture consumes around 5,000 km3 per year. This throws new light on future options available to feed a rapidly growing world population. With fewer options to increase blue water use for irrigation, there is increasing evidence of large untapped water potentials in rainfed farming systems, particularly in developing countries, where there is the biggest need.

We need to focus on increasing productivity of agricultural land (but not at the expense of ecosystem functions), and emphasise agricultural and water productivity in rainfed agriculture. If this succeeds, we can avoid a future with continued unsustainable exploitation of water for food.

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David Molden

Yes and No. Our food is too thirsty in wealthy countries but, in many parts of world, hungry people desperately need more water.

It takes between 500 and 2,000 litres of water to produce a kilogram of wheat, depending on production practices. When grains are fed to animals for meat, milk and eggs, the amount of water required for food production increases substantially.

A vegetarian diet is much less water intensive (closer to 2,000 litres per person per day) than one dependent on grain-fed meat (up to 5,000 litres per person per day), but there is an increasing desire for meat products in the world's growing economies.

Consequently, in many of the world's breadbaskets, there simply is not enough water to go around. The Colorado, Murray-Darling, Indus, Nile and Yellow Rivers are but a trickle when they reach the sea. Competition and inequities in water use abound. Wealthier countries must encourage water-efficient food habits through education, and food and water policies. There is an urgent need for economic incentives to grow more food with less water, and reduce the food waste between farm and fork that leads to astronomical water wastage.

In sharp contrast, many of the 800 million undernourished people are thirsty for more water for more food. Over 1.4 billion people live in areas of economic scarcity, requiring policies and investments in water infrastructure (small and large), technologies and institutions for more water.

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Technology

Can desalted water feed the world?

Stuart Downward

Agriculture accounts for 70 percent of global freshwater abstraction.[1] In the coming decades around two-thirds of the world's population will face water scarcity driven by the physical availability of water set against regional population growth.[2] Climate change will exacerbate droughts, testing our resilience and agricultural adaptability. Water scarcity is also 'structural', affecting economic resilience to malnutrition.

Lack of knowledge concerning water resources and their sustainable use, misappropriation and inefficient use of water resources, and the ability to pay for water mean that millions will lack access to clean freshwater for domestic and agricultural needs. A global trade in 'virtual' water, embedded in crops and livestock, has sought to balance spatial and temporal inequalities between water distributions and people, but the FAO estimate that 40 thousand people die every day from malnutrition related diseases.

Technological solutions for meeting water demands are as old as civilisation, and our hydro-engineering ambitions have increased alongside our demand for food. In the 20th century, a six-fold increase in water demand was met by mega-dams and water transfers that have re-plumbed the planet, diverting water to fields and cities. Hardly a great river remains untapped and boreholes have been sunk deep into ancient aquifers. Now though, food prices are increasing alongside record agricultural production that is out-pacing population growth. A recent UK Cabinet Office report attributes this to three factors.[3]

First, biofuel production competes with food for agricultural water. In 2007, one-third of all US maize was grown for biofuels with 15 percent year-on-year growth projected in the near-future. Second, people in rapidly developing Asian economies are consuming more meat. Kilo-for-kilo a meat-rich diet requires twice the embedded water of a meat-poor diet. In China average per capita meat consumption has doubled in the last 20 years. Third, agricultural policy changes (for instance. EU CAP reforms) have reduced cereal stocks, pushing more land into production, diverting more water for irrigation.

At face-value, desalination (the process of abstracting freshwater from seawater, brackish groundwater and domestic waste water) offers a technological fix for feeding ourselves in the 21st century. Our oceans contain 97 percent of the Earth's water so, in theory, as long as the value of water-based goods and services produced using desalted water exceeds the costs of production, desalination can be considered economically sustainable. This is the case in many parts of the Middle East. Kuwait receives the majority of its water from thermal desalination facilities. And water poor islands such as Lanzarote have seen their tourism industry flourish thanks to desalination.

Recent advances in reverse osmosis (RO) technology, economies of scale and energy recovery systems have dramatically reduced the operational costs of desalination. It is the hot topic around the globe, with desalination capacity expected to at least double over the next 20 years.

Spain plans 21 new desalination facilities, Perth is building the world's largest renewable energy desalination facility, South Africa is experimenting with nuclear desalination. Even London, faced with a repeat of structural water shortages in 2006 and anticipated population growth in southeast England, plans a desalination facility on the Thames Estuary.

The advantages are clear: desalination provides hydro-independence from the environment and independence from climatic uncertainty. With careful regulation it offers the opportunity to recover and restore over-abstracted rivers and wetlands and their fragile habitats. If it can irrigate the world's fields and greenhouses, could it fulfil the UN's millennium goal to provide food security for all while safeguarding the environment?

Desalination alone is not the answer. Despite huge technological advances, desalted water is very expensive at approximately $0.5/m3. Energy requirements set against rising oil costs and the cost of brine and anti-foulant disposal means that, unless subsidised, desalted water will remain too expensive for agricultural use and be irrelevant to poor farmers. Desalted water will always be sold to those who are willing to pay the highest prices. And with the world's urban population exceeding rural populations, our cities will out-bid agricultural users of water for all but the highest value crops.

Europe's largest RO desalination facility at Carboneras in Spain was planned to supply much-needed water to horticultural farmers. But farmers continue to plumb over-abstracted aquifers, because the desalted water pipelines follow the coast, supplying water to booming coastal property developments and water intensive golf resorts. Plans are afoot to fill water tankers destined for the drought ridden city of Barcelona.[4]

Desalination must be part of an integrated and regulated regional water resource management strategy that addresses water demands and water supply. This must include full-cost recovery and subsidy transparency to encourage water savings. Urban consumers of desalted water will return large quantities of 'waste' water back to the environment that could be reused for agriculture. For example, Almería in Spain receives a proportion of its water from desalination. The city's waste water is collected, 'cleaned' and re-used for horticultural and citrus production in the Andarax valley north-east of the city.

Regulation must ensure that farmers don't desalt brackish groundwater that cannot be sustainably recharged or dilute poor quality groundwater with high quality desalted water to obtain an acceptable mix. This would only increase over-abstraction. Energy requirements must be evaluated so that potential environmental gains are not outweighed by undue increases in greenhouse gas emissions. Desalination will not solve world hunger, but if planned and managed wisely it can help.

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Mike Acreman

Policy

Agriculture needs ecosystems, ecosystems need water

Water is essential for all life on Earth. Our success as a species relies on our ability to store and use water for drinking, growing food, driving industrial processes, harnessing its ability to generate power, and fighting against natural hazards, including floods and droughts.

But clean water is in short supply in many parts of the world and becoming increasingly scarce as populations grow, water supplies become polluted and our climate varies. Water management has become vital for future human welfare and development.

A key aspect of water management is its allocation between different users: water for direct human needs, agriculture, industry, and power generation. And, in a footnote added by water managers in recent years, we also need water for the environment. This presents water allocation as a conflict – choosing water for people or the environment.

International initiatives over the past 20 years, kick-started by the Bruntland Report, Our Common Future, and the Rio Conference in 1992, have marked a turning point in modern thinking. They recognise that ecological processes keep the planet fit for life, providing food, air to breathe, medicines, and quality of life. So, while people need direct access to water to drink, grow crops and drive industry, providing water to the environment means using water indirectly for people, ensuring economic and social security as well as ethical security, by upholding the rights of people and other species to water.

That is why the governments of the United Nations have made an ethical commitment to the environment in the form of the World Charter for Nature, and why central to Agenda 21 and Caring for the Earth (IUCN/UNEP/WWF, 1991) is the premise that people's lives and the environment are profoundly inter-linked.

This fundamental concept has permeated all aspects of water resource management. The new water law of South Africa states that: "the quantity, quality and reliability of water required to maintain the ecological functions on which humans depend shall be reserved so that the human use of water does not individually or cumulatively compromise the long term sustainability of aquatic and associated ecosystems". Other countries have followed suit, including Tanzania and Costa Rica. The EU's Water Framework Directive has a similar philosophy, requiring member states to achieve Good Ecological Status in all water bodies (rivers, lakes, groundwater, estuaries and coastal zones).

In the early 1990s, the economic sense of ensuring sufficient water for the environment was demonstrated by research by Barbier et al.[1] This showed that the net economic benefits of the natural floodplain wetlands in northern Nigeria (flood recession agriculture, fishing, herding and fuelwood collection) were as high as US$ 32 per 1000 m3 of water (at 1989 exchange rates), but the returns from the crops grown on the intensive irrigation scheme (the Kano river project) were much lower at US$ 0.15 per 1000 m3. And when you include operational costs, this drops to only US$ 0.0026 per 1000 m3!

Going a step further, Costanza et al. calculated the economic value of 17 ecosystem services for 16 biomes.[2] They used these estimates to determine a value of US$16-54 trillion per year (with an average of US$33 trillion per year) for the value of the entire biosphere – almost twice the global national product total of US$18 trillion. Traditional calculation of GNP does not include the costs and benefits of ecosystem services, which contribute significantly to human welfare.

Water allocation cannot be assessed purely in economic terms.[3] Many of the poorest people of the world live directly on resources provided by natural ecosystems. Development of the Senegal river basin in west Africa has focused on water management (through dam construction) to provide water for hydropower generation, river navigation and intensive irrigation. But dam operations have seriously degraded natural wetland ecosystems along the river valley and at its mouth. The winners of the water allocation decisions are the urban elite in Senegal, Mauritania and Mali, with a secure electricity supply and cheaper food; the losers are the rural poor who depend on fishing and extensive livestock grazing on naturally flooded wetlands, but have no access to electric power.

As our population grows, increasing food productivity is essential for human survival. Allocating more water to agriculture may help in the short term, but will lead to loss of ecosystem services. Instead, research is now focused on 'more crop per drop' and responding to ecosystems' water needs, so better water allocation decisions are made, achieving the optimum total benefits of available water.

Integrated water resources management (IWRM) is central to all sustainable water development efforts, from the EU Water Framework Directive to the Millennium Development Goals. IWRM involves making the right decisions about water allocation by viewing the whole picture. There is growing awareness of the economic, social and ethical imperatives that make allocation of adequate water for the environment critical to the way forward. We may even see consumers choosing food partly on the basis of its water use and associated ecosystem degradation footprint.

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Business

Beyond 'water footprints' and 'efficiency'

Stuart Orr

It is widely accepted that economic growth, changing diets, a growing shift toward urbanisation, increased population and the unknown effects of climate change will place acute strains on global water resources in coming years. This increase in global freshwater demand will manifest itself on a number of levels. At a social level, the already insufficient allocation and availability of clean water will continue to hamper development progress. At an ecosystem level, significant problems of over-abstraction and pollution will increase, leading to a reduction in the vital services that freshwater systems provide for humanity.

Water is already a critical issue in many countries. Companies are not the cause of all these problems, nor can the private sector be expected to solve them all. Yet, as companies begin to recognise water as vital to their business models, many have already begun the journey of establishing just how much water they use, monitoring where water is withdrawn, and assessing the impacts associated with their water intensive activities.

Depending on the nature of the end product and the sheer scale of their operations, the water intensive requirements of food and agricultural production pose significant risks for companies to monitor and redress. Over the last few years there have been an increasing number of conflicts over businesses' social licence to operate, particularly in areas where acute social housing and environmental problems exist. There is every reason to believe this trend will intensify in the future.

Measuring just how much water is used has been made easier by the recent emergence of 'water footprints'. Water footprints calculate the water use of consumption and production activities through estimates of the water used for growing crops. This began as a measure of human water use through the products we consume, such as 8,000 litres to produce 1 kg of cotton lint, or 3,000 litres for 1 kg of rice. This approach has also been tested out at the national level where, for example, the average water footprint of a UK citizen has been calculated at 3,850 litres per capita per day. This includes the amount of water evaporated (3,700 litres) through crop growth for agricultural products and the direct household water use (150 litres) of the average UK citizen.

Water footprints for business are a new concept and are designed to estimate total water use in a business operation at both direct (factory and processing) and indirect (supply-chain) levels. They will also, like individual or country studies, differentiate blue (withdrawn) water and green (soil moisture) water, and water that returns polluted to water systems.

The majority of water in most business profiles is more likely to be found in supply chains, through water needed for crop growth. It is here that water footprint measurements will need to take into the specific requirements of location and climate and, over time, account for the impact of water abstraction on the local environment.

It is hoped that company action will involve supporting partners, sharing best practice and the implementation of water management systems through their operations. Some companies have responded through the promotion of good water 'citizenship' projects in the watersheds and communities where they operate. For example, Coca-Cola has pledged to 'replenish' its direct water use through water efficiency and waste water targets, watershed management and act on supply chain issues.

Other companies are following suit and becoming increasingly engaged in 'legacy' projects in areas where they work. Similarly, organisations like the World Business Council for Sustainable Development (WBCSD) have been championing water issues for some time and have produced scenarios for business and future water supply. There has also been a recent initiative by the Food and Drink Federation (FDF) in the UK whereby more than 20 major food and drink brands have pledged to cut their water usage and improve energy efficiency.

While these efforts should be seen as positive, to evaluate them properly we need to grasp how water moves through the environment. A cubic metre of water taken from one catchment may not have the same impacts as the same amount taken from another catchment. From this perspective, community engagement and pledges to 'put water back' into the environment are fraught with complexity.

Just how long and how far can specific companies and projects take credit for their activities? It is also hard to know how well water will lend itself to off-setting, but this and other avenues are being explored. These complexities will not prevent companies from becoming more engaged in community work, but it does raise real questions about the purpose of those activities and whether or not they will actually lead to sustainable water management and reduce the risks which initially caused business to act.

More likely, businesses will move beyond the footprint of their own operations and instead engage with others in their sector and the wider policy environment to bring about security through legislation and

Continued on next page...

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management. The only real way to assuage business risk from water use is to support reforms and policies that are required beyond the companies' front doors. The alternative is to cut and run from the most water-stressed regions, and only source products from areas where the availability of water softens the impact of heavy water use.

In some cases this may be a suitable strategy but just spreading risks will only put off the inevitable. A cut and run response would do considerable harm to workers in production. A better approach would involve managed conversion to more sustainable production, perhaps through more appropriate products, so that production could continue to benefit communities while reducing associated environmental impacts.

And where do consumers fit into all of this? The consumer role in addressing the global water crisis is difficult to predict, but it is unlikely that the complexity of water issues can be explained to consumers through labels or in other ways that differentiate product lines. Of course, some consumers will be able to navigate the issue and make informed choices, but can business really wait for financial returns through single product lines to reduce their risks? And can this happen at the scale that is required? I doubt it, mainly because the largest business risks are at the production end, and it is here, where water is taken from often fragile social environments, that reputations will be tested. It is more likely that differentiation on water issues will be promoted at the level of community engagement and the 'water wars' between retailers will be fought through their public commitments to reduce and engage.

All attempts by business to engage in community work to reduce water use should be applauded and incentivised, as should similar efforts across certain industries to work in partnership to reduce adverse impacts. But businesses need to be aware that these efforts are literally a drop in the ocean if supply chains are not factored into the equation, and will also prove pointless if support for water management outside of their own operations is not also part of their strategy.

As water issues begin to rise up the political agenda, everything that water users do is coming under greater scrutiny. How far business will be willing to move beyond 'footprints' or 'efficiency' is still unknown, but the signs are that water is far too important to remain just a corporate social responsibility (CSR) issue.

Water scarcity is an issue that requires more than just reducing individual water use, and must lead to more effective business support of water management globally. This could be an uncomfortable place for business, a policy arena where the benefits may not seem so obvious; yet the consequences of getting water wrong are profound. The planet cannot add another 3 billion people while confronting the effects of climate change and maintain the freshwater ecosystems on which we all depend, without businesses taking a more active role in sorting out their own and everyone else's water needs.

Water and power

Can we achieve global water equity?

WORLDVIEW

Maria Arce Moreira

Maria Arce Moreira is Policy Adviser at Practical Action and co-chair of the development and Environment group of BOND, the UK's broadest network of voluntary organisations working in international development.

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"Water always tends to flow towards power" a South African woman activist said, reflecting the reality of over 1 billion poor people worldwide without access to safe drinking water. This is despite international recognition of the human right to water as indispensable for leading a life of human dignity.[1] The multiple and often conflicting uses of water for drinking, food, energy and recreational purposes, among others, often restrict access to those who need it most, and can affect their ability to produce food and their human right to feed themselves.[2]

The current development model has exacerbated consumption patterns. Value is ascribed to using water that can be successfully traded, in ways that promote economic growth rather than to produce products that provide basic water and food needs. This power imbalance ultimately defines how water is used and who benefits most from it.

Water is needed to produce local and imported food products but the impacts, risks and benefits are substantially different depending where the producer and consumer are located and what power each has. It is estimated that it takes 1,000 litres of water to produce one kilogram of wheat and five to 10 times more water for meat.

The demand for water is rising steadily with population growth and with increasing demand for processed products and consumer goods: it is estimated that demand may triple in the next 30 years. At the same time, purchasing power and demand define what is available, and a significant amount of staple foods imported into the UK and other wealthy countries are produced in developing countries. Running through all these transactions is a powerful and silent trade of water resources that remains conveniently invisible.

The virtual water flows included in food products are estimated to be 700-1,100 km3 per year and are expected to more than double if trade liberalisation continues. Wealthy countries – even if they are water rich – benefit from this situation without question or remorse. The trade in virtual water theoretically gives advantages in terms of efficiency and water security. But efficiency does not often translate into increased equity and fairness.

Demand from affluent markets creates opportunities for some, but the demands of poor households and peasant farmers for access to sufficient water for domestic and agricultural use tend to be ignored against the impressive power that corporations, the market and wealthy consumers have in the allocation of this increasingly scarce, but profitable, resource.

There is growing concern that the production of agrofuels for export – to mitigate against climate change – will have a detrimental impact on water resources in developing countries. And climate change could also shift the distribution of world food production by increasing the risks and reducing the productivity of developing country agriculture, making them more dependent on food imports from other countries. In both cases, the balance seems to favour the interests and needs of the powerful rather than ensuring a sustainable use of water resources to benefit the poor.

Increasingly, urban elites in developing countries are replicating consumption patterns of the industrialised world, leading to increased water use, the marginalisation of small artisan producers, and a loss of producer control.

Communities sharing the 'benefit' of exporting crops may find that profits are not divided equally, exacerbating processes of disempowerment and inequality. Poor female subsistence farmers may find access to water denied because the production of export crops is prioritised.

Even in industrialised nations, increased supply of a full variety of food products in the supermarket has not necessarily translated into more effective use of food or increased nutrition levels. In fact, it has encouraged waste. In the UK alone, it is estimated that one third of food is thrown away. This problem is receiving increased attention because of the methane gas emitted by rotting food in landfills and the increase in GHG emissions that this represents. But perhaps the more important question should be: does our lifestyle and throw-away food culture represent an infringement of the essential rights to water and food of others, especially the poor in producing countries?

The poor in developing countries are not alone in this silent crisis. Modern plant breeding and industrial food processing have developed ways of increasing the water content of many fruits, vegetables, meat products and processed foods, reducing their nutritional value while maintaining profits. Low income groups in industrialised nations choose those products because of their competitive price, but those choices have a negative impact on their nutrition. In the end it is always the powerless and most vulnerable who will suffer unless society accepts the challenge to transform the perverse market-based system that – through trade in real and virtual water – leads to water shortages, over-consumption and waste.

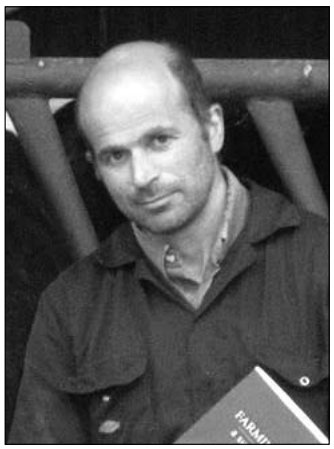
[1] General Comment 15 of ECOSOC.

[2] Article 11 of the International Covenant on Economic, Social and Cultural Rights.

Glorious mud

Better soil management could help stop floods and drought

ON THE FARM



John Turner

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In the same week that the flooded fields and villages around Tewksbury once again made the headlines, we found ourselves digging holes for some new gateposts on the farm, and struggling to get a spade to penetrate the near-concrete dryness of ground. Not that we escaped our fair share of the deluge. We too had fields of standing water, but the pattern of rainfall, where an entire month's worth falls in a matter of hours, means that surface water often drains away before it's had time to penetrate through the soil profile.

When flooding starts threatening homes (and the insurance companies who provide their security) rather than just waterlogged crops or stranded livestock, things start happening. Culprits are identified and hasty remediation schemes mobilised, often needing hefty budgets to support them.

News reports laid the blame squarely at the doors of climate change and – inevitably – 'intensive farming'. The 'solutions' served up to concerned viewers were largely confined to creating flood plains on farmland to act as buffer reservoirs in times of peak water flow, and improving weather forecasting – presumably to allow more time to pile the sandbags up against the door.

It's natural to consider how best to deal with the symptoms, but we also need to understand the causes and the changes that could be made to alleviate these problems in the first place.

From a farming perspective, one of the most important factors affecting water drainage and water retention is soil organic matter. This sponge-like quality within soils provides aeration, acts as a reservoir for carbon and has a host of other benefits.

Yet outside farming circles (and surprisingly often within them as well), the relevance of soil organic matter content appears to be largely overlooked. Many of the farming practices adopted in the push for production during the years leading up to the Second World War, and over the following four decades, contributed to a severe decline in the organic matter within soils.

To a large extent this decline has been masked, because plant nutrition has been provided by synthetic inputs and growth regulators, which ensure that nutrients are directed towards grain production rather than plant growth.

Modern agronomy means that, in a regime approaching hydroponics, soils can be used as a medium for supporting crops, with the grower providing all nutrition, protection and other forms of support. This approach is slowly becoming more enlightened, and the importance of soil structure and maintaining organic matter is beginning to be more widely reflected in crop management plans, if not always in practice. Nevertheless, the process of rebuilding levels of organic matter in soils is incredibly slow, and it can take decades to repair the damage of a few seasons' worth of bad practice.

The lack of capacity within soils to retain moisture not only causes problems in times of too much water. It also means that the margin between a surplus and a deficit of available water is reduced and drought can affect crops swiftly.

Last spring, we struggled with the wet weather when we were trying to prepare the seedbeds for the spring-sown barley, and we finally managed to get them drilled by the end of March. By the end of April, we were already seeing the signs of uneven germination due to water shortage and had fields where nearly half the crop finally emerged some six weeks after the rest had germinated. This led to a harvest of considerable variation in ripeness and a similar variation in quality – a pattern that was repeated throughout much of the country.

The farming system we follow is one of those most suited to improving soil organic matter content. Crop rotations are interspersed with grass leys, and the root systems of red and white clover improve soil structure and add further organic matter. Worm populations are high and they transfer organic manures into the soil profile. Cultivations are kept to a minimum and timed to retain nutrients and prevent the oxidisation of the precious organic matter. And yet, after 10 years of following this farming system, the soil samples that we take annually show improvements of only a fraction of a percent per year.

On the strength of this glacial rate of change, improving soil organic matter content is not the sort of miracle solution that is going to grab headlines or feature high on the priority list of those concerned with flood control or climate change. Nevertheless, spread over the area of farmed land we have in this country, even a fractional increase in organic matter content would have a huge impact on our ability to absorb the changing patterns of our weather and really ought to provide the cornerstone of any model of sustainable farming.

The Business Page

No future in bottled water

Jeanette Longfield

On the face of it, it seems ridiculous to propose that there's no future in selling bottled water. Some predict that the UK market will increase from £1.2 billion in 2006 to £1.65 billion in 2010. In 2006, the combined markets of Europe, the US and Japan was worth an estimated £16 billion and continues to rise.

The market is being driven by several powerful trends. Some people, realising that sugary fizzy drinks are contributing to obesity, are turning to healthier alternatives like calorie-free water. Others, particularly young women, see branded bottled water as a must-have fashion accessory. And yet more are turning to bottled water as a convenient, lightweight, portable and attractively packaged alternative to its humble cousin – tap water.

But there are growing signs that our love affair with bottled water may be coming to an end. People are starting to notice that plastic water bottles contribute an awful lot of waste to our already bulging bin bags. They are also spotting the absurdity of water being transported thousands of miles from Fiji when a home-grown version is available in their kitchen.

And some are starting to feel distinctly ripped off by a bottled product that costs, at best, around 500 times more than its mains-fed equivalent. This really sticks in your throat when blind taste tests continue to show that most people can't tell the difference between bottled and tap water.

A recent survey of 1,000 people published by the National Consumer Council revealed that 70 percent of respondents thought bottled water was too expensive. But when ordering tap water at a restaurant, 20 percent of respondents said they were 'too scared' or 'too nervous' to ask for it, opting instead to purchase bottles of still or sparkling water for up to £4 a bottle.[1] A whopping 83 percent thought that tap water should be offered by the waiter instead of still or sparkling water, and almost all respondents thought that tap water should be offered for free.

Moreover, with climate change and carbon footprints on everyone's minds, people are beginning to understand that products can do all kinds of damage to biodiversity and livelihoods in poor countries. The concept of "embedded water" is not yet common currency, but how long will it be before people cotton on to the scandal that, in a water scarce world, an estimated two litres of water are used for every one litre purified and put into a plastic bottle? And making that bottle took another seven litres of water.

The UK government is becoming increasingly sensitive to the accusation that, while asking voters to 'do their bit' for the environment, it is wasting large amounts of their money on bottled water. In January 2007, when Sustain launched its attack on the bottled water industry,[2] the Food Standards Agency was keen to make the following statement:

"[We] will now provide tap water on request for all meetings held at Aviation House and from January 2007 will also be able to provide mains-fed bottled water in 70cl re-useable bottles. This latter option will be chilled and bottled on the premises. There will also be a facility to carbonate water on site. This will replace the current system of bought-in bottled (still and fizzy) water thereby saving on waste (boxes), energy (transportation) and promote re-use of bottles."

A quick survey by Sustain at the time showed that, by contrast, the Cabinet Office, the House of Commons, the Treasury and the Departments for Health all routinely served bottled water and some agencies, such as Ofcom, were unwilling to provide any information. Our new report – just published – updates this survey and shows that most government departments are now "greening up" and turning on the tap - but still buying bottled water as well.

Food industry analysts Food Navigator reported in January this year that Chicago had imposed a five cent tax to discourage bottled water consumption. This follows

Sustain's report

a pattern set last year by New York's publicity campaign for tap water (as part of a programme to cut packaging waste) and, best of all, San Francisco Mayor, Gavin Newson, has banned city departments from using public money to buy bottled water.

Canada and Australia are also sprouting tap water campaigns and, in the UK, Sustain is not alone in championing this cause . But the bottled water industry is not taking it lying down. One of their many responses is to 'add value' by including ingredients such as vitamins, minerals, and flavourings. Unfortunately, these ingredients often contain artificial sweeteners, and since health concerns around them simply refuse to go away, it makes this an unpromising escape route for the bottled water industry.

So is there a future for the bottled water industry? I hope not. Once upon a time, there used to be attractive drinking fountains in public places. For environmental reasons, and as part of a rejuvenation of public space, it would be wonderful to see their return.

Jeanette Longfield is the co-ordinator of food and farming charity Sustain: the alliance for better food and farming. She is also a member of the Food Ethics Council.
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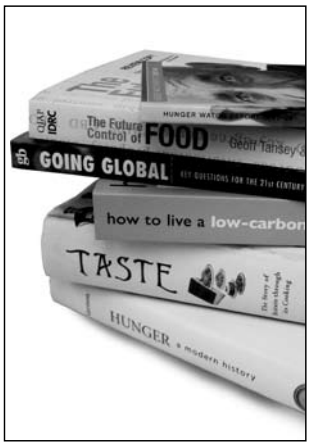
[1] National Consumer Council (2007) www.ncc.org.uk/news_press/pr.php?recordID=361 16 November.

[2] Sustain www.sustainweb.org/publications/info/152/

Reviews reading



Food: an analysis of the issues
2008 | Cabinet Office
The first report from a cross-cutting UK government project on food policy. Light on narrative but making up for it with graphs, this collection of over 100 slides will outlast its immediate purpose, which is to inform the project's thinking on future policy. A wide and digestible snapshot of how we eat, where our food comes from and what lies on the horizon. TM

Going global: key questions for the 21st century
Michael Moynagh & Richard Worsley | 2008 | A & C Black
A fascinating exploration of some of the 21st Century's burning questions. Drawing on a wide range of academic research this book investigates twelve global issues as diverse as the war on terror and climate change, summarising our current position, assessing where we are going, and asking what the implications might be for the future stability of our global community. EB

How to live a low-carbon life
Chris Goodall | 2007 | Earthscan
A compelling plea to individuals to take action to reduce our global carbon output. Author Chris Goodall shows us that if we make changes to our domestic energy use and consumer habits we can reduce our carbon emissions by 75 percent. This book is a must for people worried about the effects of global warming and determined to do something about it. EB

Hunger: a modern history
James Vernon | 2007 | Harvard University Press
A wide ranging account of the changing perceptions of hunger in the 19th and 20th centuries. This book is a detailed historical analysis of the social and political responses to hunger and famine, ending with the birth of the welfare state. EB

Taste: the story of Britain through its cooking
Kate Colquhoun | 2007 | Bloomsbury
An entertaining and well-researched history of British food and cooking, starting with the Roman invasion and bringing us up to date with 21st Century microwave meals. Kate Colquhoun uses recipes and innovations in food to explore the changing nature of Britain over the ages. EB

The future control of food
Geoff Tansey & Tasmin Rajotte | 2008 | Earthscan
A guide to the opaque world of intellectual property, where unequal struggles shape our food system decades into the future. Intellectual property rules are vitally important but rarely described with such vitality. FEC member Geoff Tansey and Tasmin Rajotte from the Quaker International Affairs Programme bring the subject alive with this collection of plain-speaking insider analysis. TM

The justice of eating
Samuel Hauenstein Swan & Bapu Vaitla (eds.) | 2007 | Action Against Hunger
Up close and personal, this book shows the brutality of living with hunger day in, day out in five countries in Africa. It shows why the right to food, not just the right to survive famine conditions, must be central to policy making north and south. It looks to build on the successes of those working to realise that right, and to tackle the imbalances in power that ensure hunger remains. GT

eating out

By Clive Bates
Clive Bates is Head of the UN Environment Programme in Sudan based in Khartoum, which is part of UNEP's Post-Conflict and Disaster management branch (postconflict.unep.ch)

Ozone café
Khartoum, Sudan

How I rate it
Overall ****
Fairness ****
Health *
Animals ****
Environment **
Taste ****
Ambience *****
Value for money ***
(maximum five stars)

Magnet for aid workers, meeting place for stylish Sudanese, and somewhere to read five-day old copies of the Financial Times; Ozone Café is a modern Khartoum institution.

Ozone is an outdoor café located in a rare green oasis in an otherwise noisy, brown and dusty city – there are gardens, and a large tree provides shade and atmosphere. The garden seating area has three bakeries attached, making wholemeal bread, ciabatta, croissants, sandwiches, cake and ice-cream. Add in a rich, strong Arabica coffee and plentiful mango, papaya and grapefruit juices, and you have a popular, relaxing escape from the frenzy of Khartoum (where the driving attitude is 'Mad Max' and the driving ability is 'Mr. Bean').

I opt for a cheese croissant, Mediterranean quiche, black coffee and grapefruit juice. The croissant is gorgeous: thick and stretchy, generously made with butter and cheese and served slightly warm. The grapefruit juice is slightly 'sangue' and sour in a good way, and the staff know not add sugar by default (rare in Sudan). The quiche is very fresh with a light creamy filling and a generous layer of roasted vegetables.

No arguments about outdoor heaters here… we are in the middle of winter and it is a pleasant 28°C. If only Khartoum's balmy winter might last…! The temperature will climb steadily from now, peaking at perhaps 50°C in June/July. At this point all the advantages of an outdoor café would be lost in the blistering heat. Ozone has an innovation to overcome this – outdoor air conditioning. The café's perimeter is marked by a pipe through which a fine mist of water can be sprayed over the seating area. The water is vaporised by the sun and hot air, and the water's latent heat of evaporation drawn out of the surrounding atmosphere, creating a cooling effect and keeping the business running profitably for most of the year.

I'm breakfasting under a cloudless sky and reflecting on Sudan's reputation as a dry country. That's certainly true in much of Darfur, where communities depend on groundwater and are vulnerable to low rainfall. But surprisingly perhaps, Sudan overall has more water per head than England – mainly because about 100 cubic kilometres flow in each year from Ethiopia, Uganda, Kenya and other countries through the Nile.

But even the mighty Nile may become stretched beyond sustainable limits. The Nile basin covers 10 countries and the two down-stream countries – Sudan and Egypt – could double in population by 2050. Upstream environmental degradation, deforestation or poorly designed dams cause siltation, algae blooms, flooding and erosion that affect the downstream countries.

Take these underlying pressures and add in the instability of climate change and the possibility that Southern Sudan will vote for independence from the North, thus creating a pivotal new country in the Nile basin, and you may reasonably expect some turbulence ahead.

But for now, it's a lovely weekend morning, we are neither short of water nor under water, and I'm concentrating on the croissant and coffee.

forthcoming events

food ethics

1st Mar '08	**Serving up Sustainability: Meeting the Demand for Food with Values** Sustain | www.sustainweb.org/page.php?id=413 | London, UK
4th Mar '08	**Food Security: Are we Sleep-Walking into a Crisis?** City University | eventsrsvp@city.ac.uk | London, UK
4th Mar '08	**Corporate Carbon Footprinting** Haymarket Events | www.haymarketevents.com/conferences | London, UK
4th Mar '08	**Food Labelling Policy** Westminster Food & Nutrition Forum | www.westminsterforumprojects.co.uk | London, UK
4th Mar '08	**Serving up Sustainability: Where to Find, & How to Specify, Supplies of Sustainable Food** Sustain | www.sustainweb.org/page.php?id=413 | London, UK
12th Mar '08	**Green Feast: Exploring the Multiple Meanings of Sustainable Food** Living Rainforest & Elm Farm Research Centre | www.livingrainforest.org | Berkshire, UK
17th - 19th Mar '08	**Organic Food & Farming Fit for the Future** Colloquium of Organic Researchers | www.organicresearchers.com | Cirencester, UK
20th Mar '08	**Serving up Sustainability: Standing Out from the Crowd** Sustain | www.sustainweb.org/page.php?id=413 | London, UK
2nd Apr '08	**The Business Response to Climate Change** Resurgence & Friends of the Earth | www.resurgence.org | London, UK
2nd - 4th Apr '08	**Food Security & Environmental Change (includes FEC session)** GECAFS | www.gecafs.org | Oxford, UK
2nd Apr '08	**Greening the Greenhouse: Designing a Carbon Neutral Future** Living Rainforest & Elm Farm Research Centre | www.livingrainforest.org | Berkshire, UK
6th - 9th Apr '08	**Food & Drink Expo 2008** William Reed | www.foodanddrinkexpo.co.uk/index.php | Birmingham, UK
8th - 9th Apr '08	**Water Efficiency Conference** Waterwise | www.waterwise.org.uk | Oxford, UK
8th - 9th Apr '08	**Dieticians, Food & the World** Community Nutrition Group | www.cnguk.org | Swanick, UK
16th Apr '08	**Food Ethics for Industry** Food & Drink Innovation Network with Food Ethics Council | www.fdin.co.uk | Birmingham, UK
17th - 18th Apr '08	**Organic Agriculture & Climate Change** IFOAM | www.ifoam.org/events | Clermont-Ferrand, France
24th - 27th Apr '08	**The Real Food Festival** Brand Events Group | www.realfoodfestival.co.uk | London, UK
1st - 2nd May '08	**Food Service Conference: The Challenges of Catering for the Ethical / Responsible Consumer** CCFRA | www.campden.co.uk | Chipping Camden, UK
14th May '08	**Livestock & Global Climate Change** BSAS | www.bsas.org.uk | Hammamet, Tunisia
22nd May '08	**Ethical Trade & the Food Industry** CCFRA | www.campden.co.uk/training/train.htm | Chipping Camden, UK
28th - 30th May '08	**Sustainable Consumption & Alternative Agri-food Systems** SEED Unit, Liège University | www.suscons.ulg.ac.be | Arlon, Belgium
3rd - 6th Jun '08	**The Royal Show** RASE | www.royalshow.org.uk | Warwickshire, UK
4th Jun '08	**Resilient Culinary Cultures** Agriculture, Food & Human Values Society | www.afhvs.org | New Orleans, USA
11th - 13th Jun '08	**Sustainable Irrigation** Wessex Institute of Technology UK | www.wessex.ac.uk | Alicante, Spain
18th - 20th Jun '08	**IFOAM Organic World Congress: Cultivate the Future** IFOAM | www.ifoam.org/events | Modena, Italy
19th - 22nd Jun '08	**Royal Highland Show** Royal Highland Centre | www.royalhighlandshow.org | Edinburgh, UK
25th - 27th Jun '08	**International Scientific Conference on Agri-Food Business** IAMO | www.iamo.de | Halle, Germany
2nd - 6th Jun '08	**Sustainable Agriculture for Food, Energy & Industry** ICSA | www.sgp.hokudai.ac.jp/ICSA2008 | Sapporo, Japan
3rd Jul '08	**Recent Advances in Animal Welfare Science** UFAW | www.ufaw.org.uk | Birmingham, UK
14th - 15th Jul '08	**Food, Society & Public Health Conference** BSA Food Study Group | www.food-study-group.org.uk | London, UK
5th - 8th Sep '08	**The End of Rationality?** ISA Forum on Sociology | www.isa-sociology.org/barcelona_2008 | Barcelona, Spain