COMPETING CLAIMS ON SCARCE WATER

Fair shares

The growing demand for water will not readily lead to large-scale conflicts, says professor of Water Economics Petra Hellegers. 'With objective information, well-thought-out decisions can be taken.'

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The world population is projected to reach nine billion by 2050, with 70 percent living in cities. All those people will need to be fed, and that requires additional farmland and water. But the amount of water available is limited: only 2.5 percent of the total amount of water on our blue planet consists of fresh water, and no more than 1 percent of that is easily accessible for human use. Seventy percent of the water used by humans goes into agriculture. Households consume 10 percent and industry the remaining 20 percent. Demand for water is growing, partly due to the rapidly rising standard of living in countries such as China and India, which is leading to an increase in meat consumption. Producing one kilogram of meat takes 15 times more water than producing one kilogram of wheat.

To add to this, there is the rising demand for biofuels, including bioethanol made from sugar cane, which is a formidable water guzzler compared with traditional crops such as wheat and rice. And then there is climate change, which is creating an increased demand for irrigation water in many places.

And yet anyone who sees these trends as grounds for pessimism will not find a kindred spirit in Petra Hellegers. Hellegers works at the agricultural economics institute LEU, part of Wageningen UR, and was appointed last spring as part-time extraordinary professor of the Economics of Water and Climate Change at Wageningen University (also part of Wageningen UR). She is convinced that an integral water policy based on economic analyses can deliver improvements in the ways countries deal with water. It is often contended that water shortages will lead to wars or major conflicts between countries, but Hellegers does not believe that. 'Water is quite simply too important. Countries and regions will do everything possible to sort it out through negotiations. Economic analyses and calculations can support the decision-making and the negotiation processes,' she predicts.

DOWNSTREAM

'You can calculate what farmers can produce in a catchment area per cubic metre of water', says Hellegers, explaining how the economic analysis works. 'We are not just talking about kilograms of crops per cubic metre of water, but also about dollars per cubic metre of water, the economic water productivity. Then we can pre-calculate the consequences of a different distribution of that water over crops, farmers, sectors, regions, or over time.'

These kinds of analysis would enable farmers and managers to decide, for example, to use half the available water for their traditional rice farming, but to use the other half to grow more profitable crops, says the economist. 'Another option is to leave some water for use downstream for products with more added value.'

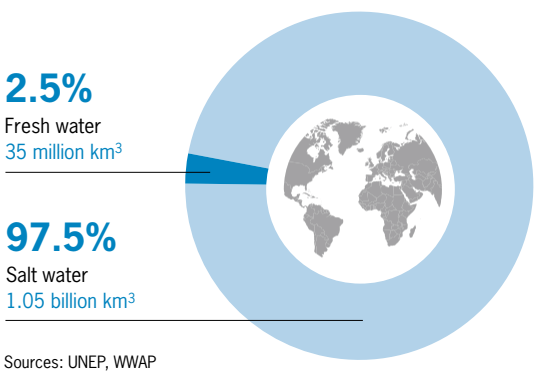
By offering local users such as farmers and managers a range of alternative scenarios like this, improving the water management becomes feasible, Hellegers is convinced. 'With objective information, well-thought-out decisions can be reached. Certainly if the water distribution is done through water rights. Farmers upstream who consciously keep their consumption down can then sell their water rights to interested parties downstream, so that they still benefit from an income.'

CALCULATIONS

Several institutions and organizations are working on developing tools for providing an overview of the vari-

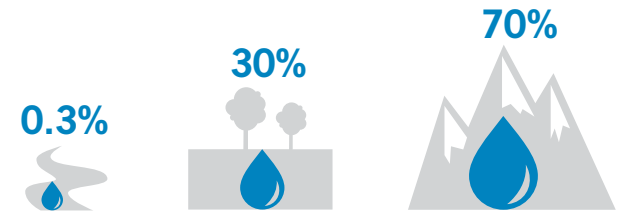
WATER AVAILABLE

Total volume water woldwide
1.4 billion km³



Sources: UNEP, WWAP

Fresh water reserves
35 million km³



ous claims on water. For example: the calculation tool WIBIS, developed for the complex case of the Incomati river basin in the border region between South Africa, Swaziland and Mozambique by the LEI together with Alterra (part of Wageningen UR), the Wageningen company Waterwatch and local partners in the stakeholder countries. Various parties in this region compete for water for food crops, biofuel crops and nature. The interactive policy support tool WIBIS makes it possible to make some calculations on the competing claims on water.
To create the tool Hellegers and her colleagues used satellite images to highlight water consumption and biomass production, and to chart water productivity. 'We distinguished 24 different management areas in the region and 15 kinds of land use. One of the other things that showed up was the relatively high water consumption of the Kruger Park, which is in the Incomati area', says Hellegers.
An internet application enables a user to see the impact of an alternative type of land use on water productivity (both in kilos and in Rand per cubic metre of water), on the distribution of the benefits, on employment and on the water supply downstream in normal, dry and wet years. Representatives from the three countries can feed in relevant information such as market prices, the prices of seed and artificial fertilizer, and the available land area. 'Various different scenarios, such as planting a large area with sugar cane, have already been simulated and discussed with stakeholders from the three countries', says Hellegers. 'The nice thing about this tool is that the information is consistent and is established in a straightforward way. That is a great help in strategic negotiations about water distribution. The interactive tool was made so as to be usable in other regions too, once region-specific data has been fed into it. We provide hard data about the price, costs, and the value of water for various crops at various locations in wet and in dry years.'
Agriculture remains an extremely complex factor, however. It is heavily influenced by globalization and trade policy liberalization, which make countries more dependent on each other for their food supplies. 'This could mean that agricultural and trade policies could have more of an influence on the demand for water than water policy does', says Hellegers.

LAND LEASING

A further complicating factor in the demand for water for agriculture is the way food production is shifting to areas with a relatively stable supply of water. As an example, Saudi Arabia announced in 2008 that it would make billions of dollars available to large agricultural companies wanting to invest in agriculture in African countries such as South Sudan. At the same time, Saudi Arabia's own wheat production has gone down by 12 percent. The aim of all this is to save precious water at home, explains Hellegers. 'Not just rich desert countries such as Saudi Arabia and the United Arab Emirates, but also companies from China, Korea and Japan are buying and leasing agricultural land in Africa on a large scale.' >

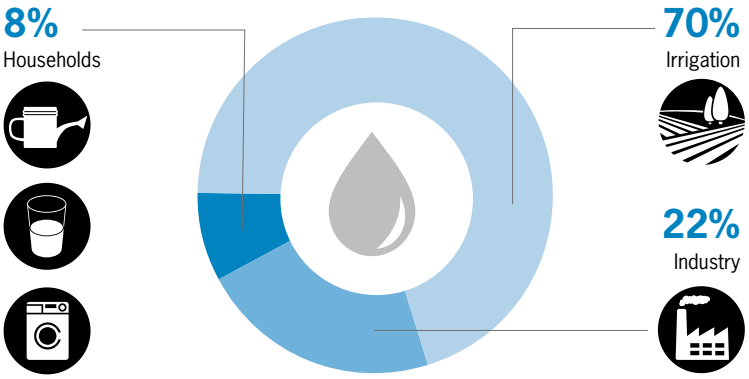
'If we have access to cheap energy, the world's water problems can partially be solved.'

Fresh water reserves
35 million km^3

Available fresh water
(for ecosystems and for human use):
0.2 million km^3

<1%

Global fresh water utilization



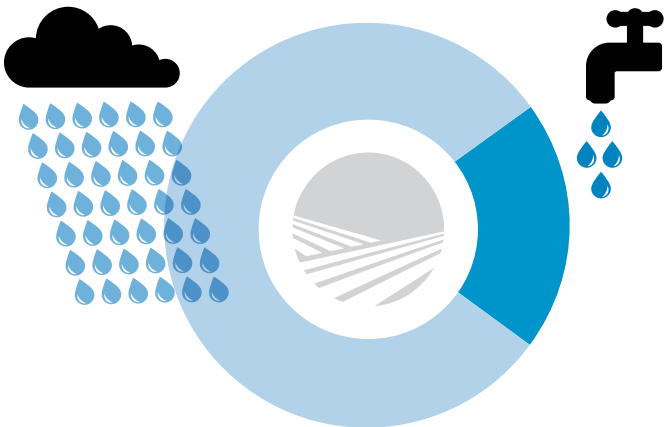
WATER AND AGRICULTURE

Area under cultivation

80% Rain-fed

20% Irrigated

Irrigated agriculture currently accounts for about 40 percent of global food production

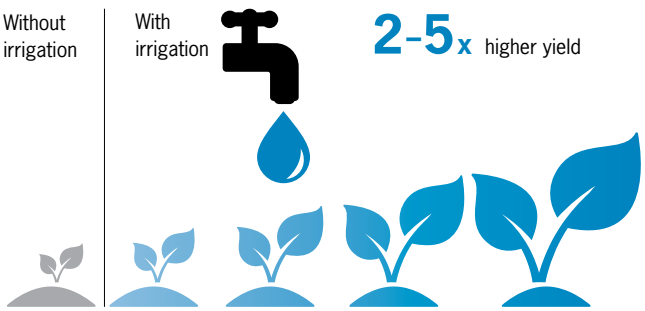


Crop yield

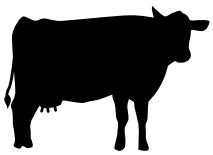
Without irrigation

With irrigation

2–5x higher yield



Water consumption in m^3 per kilo harvest



Beef **15** m^3

Lamb **10** m^3

Poultry **6** m^3

Rice **3** m^3

Grain **1.5** m^3

Citrus fruit **1** m^3

Source: Food and Agriculture Organization of the United Nations (FAO)

'These competing claims on scarce water are a major issue', says Wim Andriesse, coordinator of external collaboration at Wageningen International, the international desk at Wageningen UR. Andriesse specializes in the African continent. 'New agricultural companies from China and the Middle East are establishing themselves in Africa, and Brazil is getting involved in Portuguese-speaking countries such as Mozambique and Angola. The Brazilians in particular want to set up sugar plantations for the production of biofuels. But when companies from rich but dry oil-producing countries move into Ethiopia and Sudan, where food security is a big problem, it can create some distressing situations too. After all, those countries are already hard-pressed to feed their own populations and periods of drought can have disastrous consequences.'

EXPLOITING POTENTIAL

There is international criticism of 'land grabbing', as the new trend is called in NGO circles, because it can affect local food security and because it lays claims on land and water. The food produced is exported back to the companies' home country. In universities and among governments, the more neutral term 'land leasing' is used. Without trivializing the negative effects, there are potential advantages for the host countries too. 'Land-leasing raises the total food production and exploits the potential of the land and water better,

because of the big investments in agriculture', says Hellegers. 'It creates employment, which also benefits the local population. But a critical analysis should certainly be made of the distribution of the benefits.'
Rik van den Bosch, head of the Water and Climate Centre at Alterra, and his colleague Jochen Froebrich, team leader of Integrated Water Resources Management, agree that investments by large foreign companies can potentially have a positive effect on regional African agriculture. That is, as long as the high technology introduced merges with local knowledge. 'Private investments can bring out the innovative capacity of local farmers', says Froebrich. Contracts between local farmers and foreign investors can be used to make sure that farmers' rights are respected. What the role of the water supply should be in this is a complex question, however. Van den Bosch and Froebrich corroborate the power of sound economic analyses to provide guidance in dealing with competing claims on water.
Climate change does not make matters any easier, however. 'Climate change causes both water scarcity and flooding', says Van den Bosch. 'Because it is getting warmer, more water evaporates, while erosion from deforestation, for example, causes rivers to flood downstream', adds Froebrich.

PETRA HELLEGERS,
Extraordinary professor of the Economics of Water and Climate Change at Wageningen University

'We provide hard data about the price, costs and value of water.'

MORE EFFICIENT IRRIGATION

So it is important to find smart ways of dealing with climate change. Alterra is trying to get to grips with this in the brand-new EAU4Food programme (European Union and African Union cooperative research to increase Food production in irrigated farming systems in Africa). The programme conducts research on how to make irrigation more efficient and is looking for alternative crops that adapt to variable water supplies. The search is on, in countries including Mozambique, South Africa, Ethiopia, Mali and Tunisia. New, private investors from other countries can be drawn into the programme. 'Through our insights into the management of the river basis and the land use, we can form the cement between the various parties, both between local farmers and investors and between farmers and water managers', think the Alterra researchers, who are working with local governments, applied science universities and local and international NGOs.
One of the field of research is coping with salinization. In a pilot project due to start in Zeeland, Alterra plans to generate knowledge about salinization that could be of use to developing countries. 'Consider possibilities such as crops that are a little more salt-tolerant, smart water management that anticipates rain showers, and new desalination technology which desalinates water just enough to make it suitable for irrigation', says Van den Bosch. 'There is a lot more scope for agriculture to adjust to problems such as salinization, making adaptation to new conditions possible.'
In the long term, Hellegers expects a lot from new technology too. For example, the technology developed by the Environmental Technology chair group at Wageningen University and technological institute Wetsus, where research is done on sustainable water technology. An example is the development of energy-saving desalination techniques. 'If cheap energy becomes available, water can be harvested cheaply, transported and purified', says Hellegers. 'It is not yet feasible to use desalinated water for staple food production. In the future, it will depend on the crop prices, energy prices and technical innovation.'
Desalination now costs 50 dollar cents per cubic metre of water, cheap enough for use for drinking water or in industry. Hellegers has done the sums: 'Before desalination is viable for rice farming, for example, the price will have to go down below 0.15 dollars per cubic metre.'
'If we have access to cheap energy, the world's water problems can partially be solved. Until that time, food production will continue to shift to areas where farmers have access to fresh water.'
Andriesse thinks that the claims in these areas can at least be made more visible through objective, economically sound data, and this makes for smoother negotiations about water. 'With this knowledge fewer irrigation projects will have to fail like they did in the nineteen eighties and nineties due to poor water management.' ■