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WATER ISSUE BRIEF

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Putting Research Knowledge into Action

1 Revitalizing irrigation

The conditions that led to large public investment in irrigation in the second half of the twentieth century have changed radically and today's circumstances demand substantial shifts in irrigation strategies.

To feed the nine billion people that will inhabit the Earth by 2050, we will need to grow more food and grow it more efficiently. Given the growing demands for water from non-farm users, and that in many places there is little land to expand agriculture, boosting productivity from existing irrigated lands will be vital.

Key messages

- Revitalizing irrigation across Asia and Africa is the key to ensuring that future populations do not go hungry.
- Farmers are increasingly pumping groundwater to meet their water needs, leaving behind the old systems and institutions that managed them.
- Using agricultural landscapes for a wider range of functions can help to produce 'more crop per drop'.
- Increased investments are urgently needed in irrigation and other agricultural water management methods, using a full range of options from large- to small-scale infrastructure.

The context

Asia is the world's most populous continent, containing 60% of the world's people. Africa comes second, with 12% of the world's inhabitants. As the world's population rises from 6.8 to more than 9 billion by 2050, both these continents will face increasing demands for food and water. During the Green Revolution of the 1960s, irrigation helped India stave off famine and reduce rural poverty. Today, irrigation is stagnating. It is declining across Asia and is not widespread in Africa.

IWMI's position on revitalizing irrigation

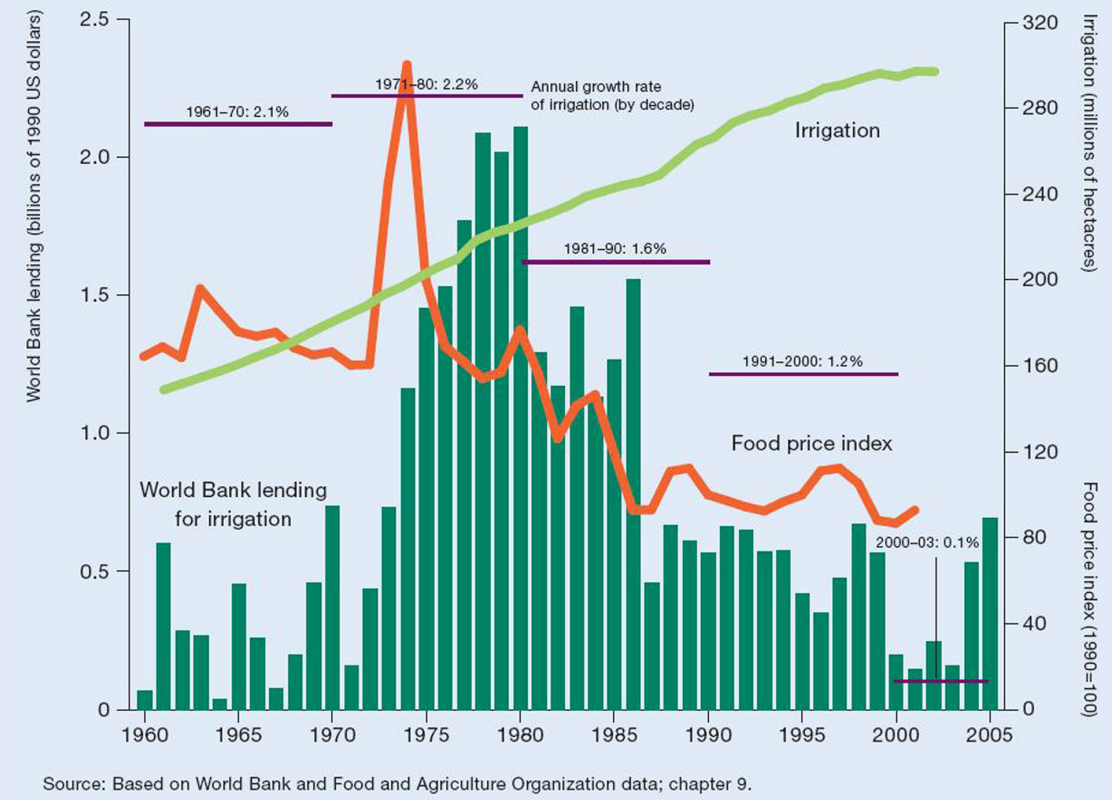
In 2007, IWMI set about assessing the world's future water needs and published its findings in the book, *Water for food, water for life: A comprehensive assessment of water management in agriculture*. Researchers came to the conclusion that it will only be possible to produce enough food in the future if governments take action to improve water use and productivity in agriculture. Different solutions will be required for different places. Sub-Saharan Africa needs investments in infrastructure and institutions, and greater success with those investments, while in Asia there is potential to obtain greater yields from existing irrigation. IWMI believes that revitalizing irrigation across these continents is the key to ensuring that future populations do not go hungry.

Action needed and how IWMI can help

Asia is home to 70% of the world's 277 million hectares (Mha) of irrigated land. In 2009, IWMI scientists assessed the extent to which Asia could boost its agricultural productivity. They used a model named WATERSIM to generate scenarios showing how the production of food, water use and irrigation requirements might change in the future, given certain economic and environmental conditions. These revealed that three quarters of the additional food supply required in Asia could be met by boosting performance from existing irrigated areas. The scientists published the results of the modeling along with an assessment of Asia's irrigation in the booklet, *Revitalizing Asia's irrigation: To sustainably meet tomorrow's food needs*.

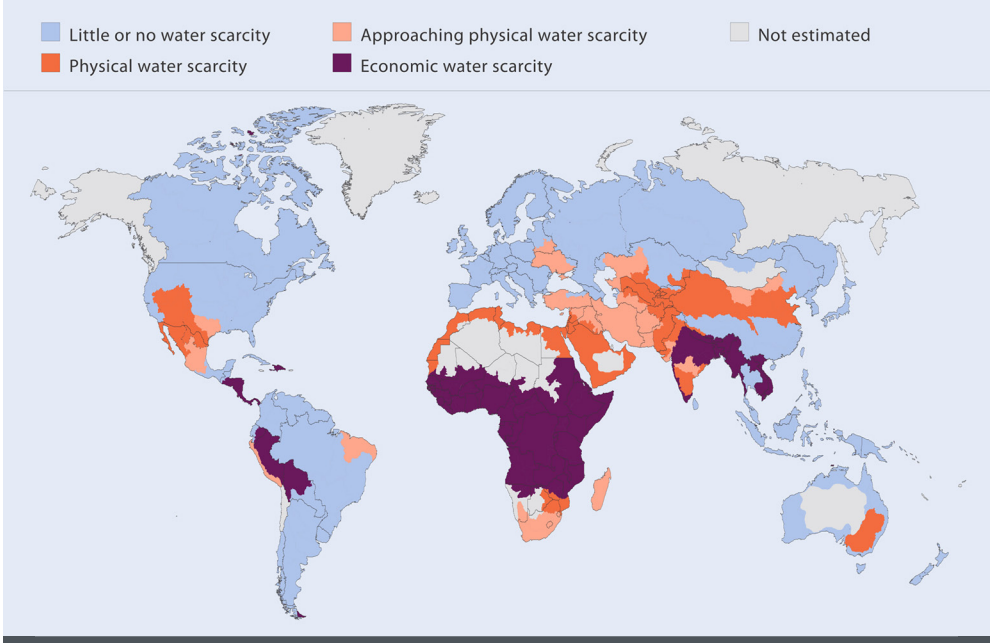
The large-scale, centrally controlled irrigation systems installed across Asia in the 1960s and 1970s have been stagnating in recent years. They were largely designed to irrigate rice and wheat crops, but many of today's farmers are growing more lucrative vegetables to meet demands from wealthy city dwellers. This type of farming requires demand-driven water supplies, rather than the supply-driven allocations provided by the old systems. Farmers are increasingly pumping groundwater to meet their water needs, leaving behind the old systems and institutions that managed them. Therefore, the authors of this book drew up five investment strategies to reinvigorate irrigation across Asia and published them alongside their scientific findings. These findings included modernizing irrigation schemes for tomorrow's needs, supporting farmers' self-installed irrigation schemes, and expanding capacity and knowledge.

In sub-Saharan Africa, irrigation is not widespread, covering only 5% of the total cultivated area of 183 Mha. This is by far the lowest proportion of any region in the world, and only about 70% of the equipped



Increased investments in irrigation in the 1970s and 1980s led to a decline in food prices. *Source*: Faurès et al. 2007[1].

[1] Faurès, J.-M.; Svendsen, M.; Turral, D. 2007. Reinventing irrigation. In: Molden, D. (ed.), *Water for food, water for life: A comprehensive assessment of water management in agriculture*. London: Earthscan; Colombo: International Water Management Institute. Pp. 353–394.



Economic water scarcity means that there is water available for use, but lack of infrastructure for accessing and delivering water where and when it is needed. *Source*: Molden et al. 2007[2].

area is operational. IWMI and the Food and Agriculture Organization of the United Nations (FAO) helped to produce the study, *Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa*, to assist banks and governments decide how to proceed to improve the situation. The study recommended increasing investment in irrigation and other agricultural water management methods, using a full range of options from large- to small-scale infrastructure. It also advised better targeting, so benefits are realized by the poor, especially women. An ongoing IWMI project will go further, by diagnosing the causes of underperformance of irrigation schemes in West Africa (Burkina Faso and Niger) and identifying whether the causes are due to institutional, infrastructural or managerial inefficiencies. These results will be used immediately by the United States Agency for International Development (USAID), the concerned governments and various stakeholders to boost production of the schemes by up to 50%.

Investing to rehabilitate degraded land can offer another means to boost productivity. A well known, but still growing, problem in large irrigation schemes is waterlogging and secondary salinization, which can be managed through on-farm remediation. An IWMI project demonstrated how vegetative bioremediation techniques using various useful plant species can lower saline water tables, rehabilitate salt-affected soils, and allow return to productive cropping in Central Asian irrigation schemes. This is important because conventional salinity control measures are often capital intensive and out of reach for many of the region's farmers. These measures can also be water intensive, putting excessive burden on freshwater resources in a region suffering from water scarcity and deterioration of water quality.

Using agricultural landscapes for a wider range of functions can also help to produce 'more crop per drop'. For example, allocating water supplies for multiple uses, such as drinking water, livestock rearing, crop irrigation and fisheries is a good way to increase efficiency at farm-scale. For example, storage ponds created by farmers to help them control water deliveries could also be used to develop fisheries. These can boost family nutrition as well as providing extra income. At landscape-scale, maintaining vital ecosystem services is essential to maximize productivity. This may entail managing non-farmed land, such as wastelands, rivers and wetlands.

[2] Molden, D.; Frenken, K.; Barker, R.; de Fraiture, C.; Mati, B.; Svendsen, M.; Sadoff, C.; Finlayson, C. M. 2007. Trends in water and agricultural development. In: Molden, D. (ed.), *Water for Food, Water for Life: A Comprehensive Assessment of Water management in Agriculture*. London: Earthscan; Colombo: International Water Management Institute.

Source

This Water Issue Brief is based on the following publications:

Comprehensive Assessment of Water Management in Agriculture. 2007. *Water for food, water for life: A comprehensive assessment of water management in agriculture*. London: Earthscan, and Colombo: International Water Management Institute.

Mukherji, A.; Facon, T.; Burke, J.; de Fraiture, C.; Faurès, J.-M.; Füleki, B.; Giordano, M.; Molden, D.; Shah, T. 2009. *Revitalizing Asia's irrigation: To sustainably meet tomorrow's food needs*. Colombo, Sri Lanka: International Water Management Institute; Rome, Italy: Food and Agriculture Organization of the United Nations.

Qadir, M.; Oster, J. D.; Schubert, S.; Noble, A.; Sahrawat, K. L. 2007. Phytoremediation of sodic and saline-sodic soils. *Advances in Agronomy* 96: 197-247.

Related IWMI publications

Open access (electronic version freely accessible via the internet)

de Fraiture, C.; Wichelns, D.; Rockström, J.; Kemp-Benedict, E.; Eriyagama, N.; Gordon, L. J.; Hanjra, M. A.; Hoogeveen, J.; Huber-Lee, A.; Karlberg, L. 2007. Looking ahead to 2050: Scenarios of alternative investment approaches. In: Molden, D. (ed.) *Water for food, water for life: A comprehensive assessment of water management in agriculture*. pp. 91-145. London: Earthscan; Colombo: International Water Management Institute.

Johnston, R. M.; Hoanh, C. T.; Lacombe, G.; Noble, A. N.; Smakhtin, V.; Suhardiman, D.; Kam, S. P.; Choo, P. S. 2010. *Rethinking agriculture in the Greater Mekong Subregion: how to sustainably meet food needs, enhance ecosystem services and cope with climate change*. Colombo, Sri Lanka: International Water Management Institute. 26p.

World Bank. 2007. *Investment in agricultural water for poverty reduction and economic growth in sub-Saharan Africa*. Synthesis report. A collaborative program of AfDB, FAO, IFAD, IWMI and World Bank. August 2, 2007. 138pp.

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