



Water and food security

KEY FACTS

- In 1999, 42 percent of arable land in Asia was irrigated, 31 percent in the Near East and North Africa, 14 percent in Latin America and the Caribbean, and only 4 percent in sub-Saharan Africa.
- Irrigation increases yields of most crops by 100 to 400 percent. Over the next 30 years, 70 percent of gains in cereal production are expected to come from irrigated land.
- In Pakistan, 80 percent of food is produced on irrigated land; in China, 70 percent; and in India and Indonesia, more than 50 percent; while in Ghana, Malawi and Mozambique the amount is less than 2 percent.
- Worldwide, agriculture uses 70 percent of all water, while in many developing countries the figure is as high as 85 to 95 percent.
- FAO estimates that irrigated land in developing countries will increase by 27 percent between 1996 and 2030, but the amount of water used by agriculture will only increase by 12 percent, thanks to improved irrigation efficiency.

The availability of water varies tremendously by region, and in some areas it is very scarce. Nevertheless, even with limited water supplies, irrigation can vastly increase agricultural productivity and is crucial to improving food security. Underused water resources in parts of Africa offer great potential for irrigation, especially using simple and inexpensive technologies. However, irrigation must be managed carefully to avoid environmental damage, which is already extensive, and the spread of water-borne diseases.

IRRIGATION AND THE FIGHT AGAINST POVERTY

Increased agricultural productivity is a key to reducing poverty in many developing countries. In Asia, for example, rural and agricultural development between 1970 and 1990 triggered high economic growth, increased incomes and improved nutrition. Because irrigation raises yields, it is essential to increasing productivity.

Farmers benefit from irrigation directly through increased and more stable incomes and the higher value of irrigated land. Communities benefit through better wages, lower food prices, a more varied diet and the health benefits of greater water availability. Studies in India and Bangladesh have shown that every job created in irrigated agriculture yields another job in

agricultural services and the processing industry.

While large-scale irrigation schemes play an important role in improving food security, benefiting farmers who have more land, many low-cost small-scale techniques can be used by poorer farmers to increase yields (see Affordable, sustainable water control, *overleaf*).

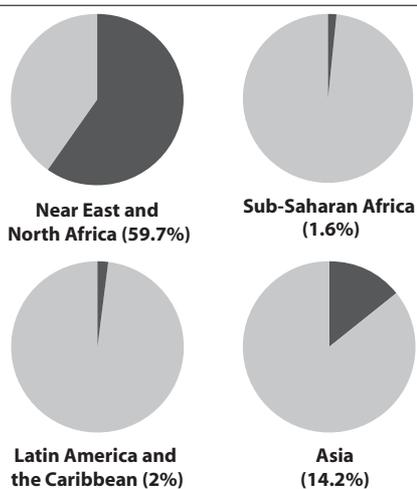
A study of three small-scale schemes in Burkina Faso, Mali and the United Republic of Tanzania found that irrigation improved incomes, diets and health. For example, when women no longer had to fetch water from far away, they had time to start market gardens, thereby improving their incomes and diets (see The future of irrigation, *overleaf*).

GROWING DEMAND, LIMITED RESOURCES

Limited water resources are already a constraint to development in large parts of the world, such as the Near East and North Africa. As development and population growth continue, this problem is increasing – as are tensions between water users. Agriculture usually faces strong competition from the municipal and industrial sectors, which are able to pay more for water. Government agricultural policy must address water allocation because of its implications for the economy and food security.

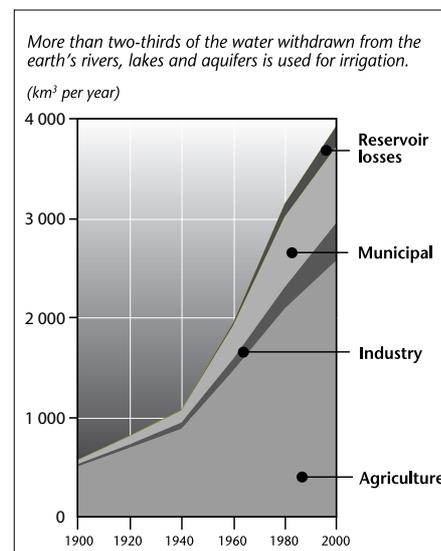
Different regions have very different water problems. Sub-Saharan Africa extracts less than 2 percent of available water for all uses and needs to make significant investments in irrigation so farmers can increase their productivity. The Near East and North Africa uses a demanding 59.7 percent of available water, and some countries are already exploiting water resources fully. In Asia, where water is abundant, 14.2 percent

of available water resources are used. In fact, land scarcity is often more of an issue than water in Southeast Asia.



Percentage of available water withdrawn in key regions.

Worldwide, only about 8 percent of the water available in rivers and aquifers is withdrawn – but it amounts to more than half of the water that is economically and technically accessible.



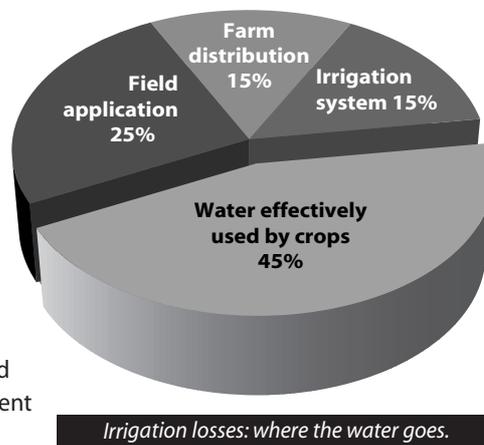
Estimated annual world water use: total and by sector, 1900 to 2000.

DANGERS OF POOR WATER MANAGEMENT

In many regions, water for irrigation is being pumped out of the ground faster than it can be replenished. In India's Tamil Nadu state, overpumping has lowered the water-level in wells by 25 to 30 m in a decade; in northern China, 64 percent of farmland is threatened by falling water levels owing to the overuse of groundwater. Much harvested water is wasted (see pie chart at right), lost through canal leakage, spillage, seepage and evaporation –

although some "lost" water reaches rivers or underground aquifers.

Unless irrigated fields are drained properly, salt builds up in the soil as water evaporates, reducing the productivity of the land and eventually making it infertile. About one fifth of the irrigated land in the developing world has now been damaged to some extent by waterlogging or salinity.



Source: FAO AQUASTAT



FAO/20189/G.Diana

A low-cost treadle pump in Zambia.

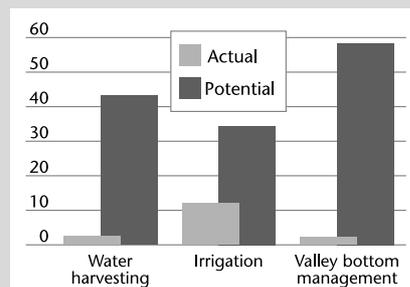
AFFORDABLE, SUSTAINABLE WATER CONTROL

In addition to small dams, wells and canals, a variety of simple, affordable techniques can increase food production for small-scale farmers without excessive withdrawals or damage to the soil. Examples include:

- **Water harvesting.** Irrigating crops, pastures and trees with rain runoff can significantly improve both yields and the reliability of agricultural production. Experience in Burkina Faso, Kenya and the Sudan shows that rain harvested from 1 hectare for supplementary irrigation of another hectare can triple or quadruple production. Techniques vary from large-scale water catchment to simple "eyebrow terraces," mounds of earth that trap rain runoff at the base of trees.
- **Motorized pumps.** Cheap, reliable motors and pumps, along with an increas-

ing availability of fuel, have revolutionized irrigation. The use of small pumps by individuals and groups has begun to play an important role in augmenting food production.

- **Treadle pumps.** Simple and inexpensive, these human-powered pumps have increased poor farmers' productivity in many Asian and African countries.



Water management potential in Africa (area in millions of hectares).

Source: FAO AQUASTAT

THE FUTURE OF IRRIGATION

Without investment in irrigation, it will be difficult to increase food production, reduce the financial burden of agricultural imports and increase food security. The lack of investment in irrigation contributes to the expansion of rainfed agriculture on to marginal lands with an uncertain rainfall. This is forcing millions of impoverished people to farm in ecologically fragile areas. Without adequate water, farmers have little incentive to invest in quality seed and inputs.

The large-scale irrigation schemes of the past have lost favour because of their social, environmental and financial costs. Now, project planners are seeking the par-

ticipation of farmers in designing and managing irrigation plans, and issues of social equity and environmental sustainability are also being addressed.

A recent study of selected small-scale irrigation projects in Burkina Faso, Mali and the United Republic of Tanzania shows the way. Small dams, wells and canals built in the villages increased agricultural productivity and generated income that allowed people to cope better with "hungry periods" of the year. The projects included non-agricultural activities such as nutrition education. The benefits extended beyond increased agricultural productivity, giving women time to start market gardens and

OPPORTUNITIES FOR AFRICA

In sub-Saharan Africa, only 4 percent of cropland is irrigated. But unlike many areas of the world, parts of this region have large untapped reserves of groundwater. In addition, there is great potential for harvesting water runoff and for farming lowlands and valley bottoms that catch it naturally. With investment, this potential could be unleashed.

helping families reduce debt, increase school attendance, limit seasonal migration for work and earn cash to pay for health care.

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