



Water management: towards 2030

Agriculture policies must aim at unlocking the potential of water management practices to raise productivity, promote equitable access to water and conserve the resource base

Over the last half-century, significant productivity gains in agriculture have protected the world from devastating food shortages and the threat of mass starvation. Water management, in both rain-fed and irrigated agriculture, was instrumental in achieving those gains. A key component in Green Revolution technologies based on fertilizer application and the use of high yield varieties, improved water management helped boost productivity - or output of "crops per drop" - by an estimated 100% since 1960.

The next 30 years will throw up new challenges. As world population grows - to an estimated 8,300 million in 2030 - agriculture must respond to changing patterns of demand for food, combat food insecurity and poverty in rural areas, and compete for scarce water with other users. To meet those multiple demands, says FAO, agriculture policies will need to unlock the potential of water management practices to raise productivity, promote equitable access to water and conserve the resource base. It proposes a strategy to "re-invent" water management in the agriculture sector, based on modernization of irrigation infrastructure and institutions, the full participation of water users in the distribution of costs and benefits, and the revival of flagging investment in key areas of the agricultural production chain.

Water for crops. The water needs of humans and animals are relatively small - the average human drinks about four litres a day. But producing the same person's daily food can take up to 5,000 litres of water. That is why the production of food and fibre crops claims the biggest share of freshwater withdrawn from natural sources for human use, or some 70% of global withdrawals.

FAO's recent report *World agriculture: towards 2015/30* projects that global food production will need to increase by 60% to close nutrition gaps, cope with the population growth and accommodate changes in diets over the next



three decades. Water withdrawals for agriculture are expected increase by some 14% in that period, representing an annual growth rate of 0.6%, down from 1.9% in the period 1963-1999. Much of the increase will take place on arable irrigated land, forecast to expand globally from some 2 million sq. km to 2.42 million sq. km. In a group of 93 developing countries, water use efficiency in irrigation - i.e. the ratio between water consumption by crops and the total amount of water withdrawn - is expected to grow from an average 38% to 42%.

"If gains in water management achieved over the past 50 years are maintained," FAO says, "pressure on resources will be reduced, while the scope for transfer of water for other, non-agricultural uses will be increased." It points out, however, that past increases in productivity have been the result of strategic investment not only in water control infrastructure, but also in agricultural research and extension. Current trends in those key areas of the production chain show a sharp decline. To meet future challenges, therefore, agricultural investment must be revived and used to support a strategic package that combines research, improved agricultural practices, capacity building for water users, and promotion of global agricultural trade.

Progress will also depend on a shift from what FAO calls "a culture of supply management" to one of "demand management". FAO views positively the far-reaching irrigation reforms, beginning in the 1990s, that led to massive transfer of responsibility to local water user associations and a shift to demand-driven management strategies. Today, farmers are increasingly involved in decisionmaking and in bearing the cost of operation and maintenance of irrigation systems. "One of the first priorities of modernization is to assess the physical conditions of the irrigation system and identify the practical options for moving towards more reliable and flexible water delivery service and accommodate a variable demand for water services," FAO says. Ultimately, it is the users who must decide on the level of service they require and are willing to pay for.

"Negative externalities". But water management in the new century is not simply about crop production. "While the specific objective is to provide a more reliable and adequate water supply for crops," FAO says, "management will always have significant impacts on economic activities, environmental processes and people's health." Like industry, agriculture is under pressure to reduce the impact of its "negative externalities", particularly those associated with the application of fertilizers and pesticides.

Environmental concerns must be part of modernization in water use and management. Extraction from rivers and lakes and the construction of irrigation infrastructure invariably displaces natural wetlands which are, themselves, highly productive components of agro-ecological systems. Drainage from irrigation often results in loss of water quality, the spread of water-related diseases and soil degradation through waterlogging and salinization. To reduce these impacts, FAO says, modern water management needs to be based on strategic environmental assessments and cost-benefit analysis, constant environmental monitoring and integration of irrigation into the wider environmental context.

But there also needs to be wider recognition that sound water management produces positive results, including the socio-economic viability of

entire rural areas, through development of the social capital required to manage irrigation systems and the expansion of transport and marketing infrastructure to sell agricultural produce. Positive environmental effects of irrigation include the creation of artificial wetland systems, micro-climates and associated biodiversity. Land management for rain-fed agriculture helps control soil erosion and protect downstream areas from floods.

Policy interventions. FAO sees broad scope for policy intervention to help "re-invent" agricultural water management. It recommends a strategic approach to development of available land and water resources in order to meet demand for food products and agriculture commodities, and a broader awareness of the productivity gains that can be achieved through wise water use. Individual farmers and households need to be assured "stable engagement" with land and water resources, meaning land tenure and water use rights that are flexible enough to promote comparative advantage in food staples and cash crops. Those rights must to be matched by access to rural credit and finance and dissemination of technology and good practices in water use. There also needs to be a re-adjustment in management strategies away from formal irrigation systems and towards pro-poor, affordable technologies, such as small-scale water harvesting.

At irrigation scheme level, modernization programmes will help extract the full value out of sunk costs and reduce pressure on public funds. Modernization strategies should transform rigid command-and-control systems into much more flexible service-delivery systems. Agriculture should - and can - shoulder its environmental responsibilities much more effectively by minimizing the negative environmental impacts of irrigated production and seeking to restore the productivity of natural ecosystems.

Finally, government policy must help local markets for agricultural produce to become more effective in meeting local demands. This means investment in key public goods, such as roads and storage, as well as institutional capacity, but will also demand a more progressive role for large-scale private investment.