IWMI International Water Management Institute
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RESEARCH Update

News of the Progress and Impact of IWMI's Research • Issue 1, 2004

Confronting the Realities of Wastewater Use in Agriculture

IWMI research on wastewater use looks at productive and sustainable options in low-income countries with rapidly growing populations. This ongoing program of research is supported by the Danish International Development Agency (DANIDA), the German Federal Ministry for Economic Cooperation and Development (BMZ), and Canada's International Development Resource Centre (IDRC).

The dominant thinking on wastewater use for agriculture is that water should receive some degree of treatment first, and that strict regulations should be imposed on its use. However, many governments lack the financial muscle to build treatment facilities or enforce regulations, and many farmers rely on the resource to maintain their livelihoods. Recent research has demonstrated the need for strategies that optimize the benefits of this widespread practice, while reducing the risks.

"Policymakers and planners can maintain or increase the benefits of wastewater irrigation, while minimizing negative health and environmental impacts, by developing a realistic approach to wastewater management–one based on an understanding of all the options available," says Dr. Liqa Raschid-Sally, Coordinator of IWMI's Wastewater Program.

A farmer wades through a homemade diversion canal, which carries wastewater to his fields, Pakistan.

A valuable resource for farmers

Recent worldwide inventories of wastewater irrigation have demonstrated the contribution this widespread practice makes to the livelihoods of poor farmers. Estimates suggest that 20 million hectares worldwide are irrigated using wastewater. An IWMI survey on wastewater use in Pakistan–the first-ever nationwide survey of its kind–found that 26 percent of the country's total domestic vegetable production was cultivated with the resource. Recent studies in several Asian and African cities suggest that wastewater agriculture accounts for as much as 50 percent of urban vegetable supply.

In areas of water scarcity, wastewater allows low-income farmers to produce crops they would otherwise not be able to grow, and it is a reliable source of water even in the dry season. There is also the financial impact. Wastewater provides valuable nutrients, leading to significant savings in inputs such as fertilizer. With money earned from wastewater cultivation, farming families also benefit from improved nutrition, access to health care, and education. This practice may also "free-up" freshwater resources that would otherwise be needed for agriculture, for other beneficial uses, such as the environment. It can also limit the pollution of rivers and canals,

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Bright Spots: How Poor Communities Are Reversing Environmental Degradation

The Bright Spots initiative seeks to identify where individuals and communities have found ways to reverse land and water degradation. The project is uncovering the keys to their successes and finding ways to spread them. The goal is to enhance food security for millions in the poor South.

Despite increasing land and water degradation, there are examples throughout Asia, Africa, and Latin America where people are successfully improving agricultural productivity. "Although many communities in the poor South are struggling with the effects of degradation, there are reasons to be hopeful," says Dr. Andrew Noble, who is studying 'bright spots' in southeast Asia. "Projects and community-based initiatives worldwide are rising to the challenges posed by degradation, and overcoming them through the application of innovative strategies."

Defining a 'Bright Spot'

'Bright spots' are areas where the sustainable management of natural resources has reversed land and water degradation, and communities have attained higher food and environmental security. The research has defined

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Confronting the Realities of Wastewater Use in Agriculture

which would otherwise be used as disposal outlets. In Pakistan, an estimated 64 percent of the wastewater generated daily is disposed of in rivers or the Arabian Sea.

addition to this, the practice may result in serious environmental problems, such as the contamination of groundwater and build-up of heavy metals in the soil.

Growing International Consensus on Wastewater

There are signs of a growing global consensus taking shape on the use of wastewater in agriculture. At a conference convened by IWMI and the International Development Research Centre (IDRC) in Hyderabad, India, in 2002, the World Health Organization (WHO) agreed to take into account the livelihood dimensions of wastewater use when reviewing its guidelines.

The Hyderabad Declaration—signed by participants from 27 national and international institutions at the conclusion to the conference—supported an approach in line with IWMI's own recommendations: safeguarding and strengthening food security, while mitigating the health and environmental risks.

Read the Hydrabad Declaration at: www.iwmi.cgiar.org/health/wastew/hyderabad_declaration.htm

Health risks

There are health risks to consider—both to farmers and consumers. Prolonged contact with wastewater exposes farmers to parasitic worms, and disease-causing viruses and bacteria, and wastewater canals can act as habitats for disease vectors such as mosquitoes. Cholera and typhoid can also be transmitted by vegetable crops cultivated with untreated wastewater. In

Proper treatment facilities would lessen these risks considerably, but such facilities require large capital investments, which many low-income countries cannot afford. According to the Pakistan survey, only two percent of the country's 388 cities had wastewater treatment facilities, and in those cities with treatment plants, the capacity was limited: often less than 30 percent of the total wastewater generated daily received treatment.

Problems with banning the practice

A straight-forward ban is also unrealistic because authorities lack the resources to enforce strict regulations. The Pakistan study indicated that although municipal officials expressed concern about the use of wastewater, many admitted there was little they could do. "The limited financial resources faced by all municipalities demand that priorities have to be set, with the highest priority for drinking water supply, followed by the collection and disposal of wastewater, with little or no money available for the enforcement of water quality guidelines," says Mr. Jeroen Ensink, who led the Pakistan research.

Similarly, IWMI researchers in Ghana observed that although relevant policies and by-laws on the use of polluted irrigation water exist, because they are vague and have limited practicality, farmers don't follow them. "Farmers will continue to cultivate with wastewater—they have few alternative choices. For most, it is a 'do-or-die situation,' as this is their only source of livelihood," explains Mr. Ben Keraita from IWMI's West Africa Office.

More realistic options

IWMI research suggests that with well-crafted policies and interventions, policymakers can minimize risks associated with wastewater irrigation—and still maintain the economic benefits.

For farming families exposed to wastewater, effective interventions include the provision of protective clothing and footwear, health education programs, and regular treatment with anti-parasitic drugs, which are inexpensive and safe. Low-cost options for treating wastewater also deserve attention. For example in Vietnam, shallow aeration lagoons help eliminate disease-causing bacteria in wastewater, before it is used for aquaculture.

Partners in Wastewater Use Research

Ghana

- Kwame Nkrumah University of Science and Technology
- University for Development Studies

Pakistan

- Faisalabad Agricultural University
- Institute of Public Health
- Water and Sanitation Agency, Faisalabad

India

- Andhra Pradesh Pollution Control Board
- Hyderabad Metropolitan Water Supply and Sanitation Board

Vietnam

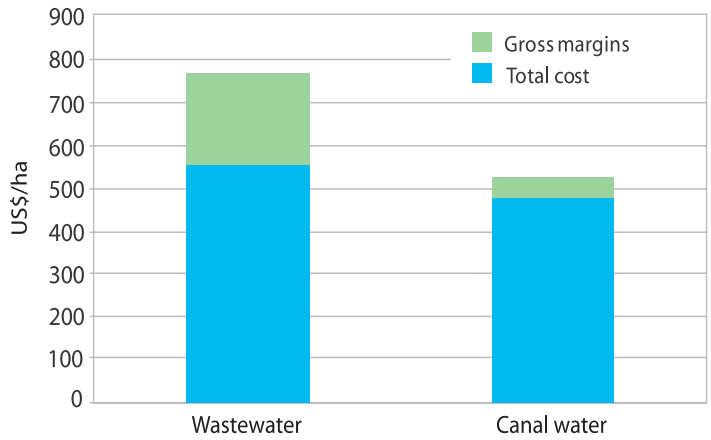
- National Institute of Hygiene and Epidemiology
- Vietnam Institute for Water Resources Management
- Danish Hydraulic Institute (DHI)
- Royal Veterinary and Agricultural University, Denmark

For consumers of wastewater-irrigated produce, cultivation and irrigation techniques that minimize direct contact between wastewater and vegetables can help reduce risks. In the Pakistan study, researchers found vegetables grown using "bed-and-furrow" cultivation were free of parasitic-worm eggs, despite the large numbers of eggs present in the wastewater they were irrigated with.

Role of government agencies

Restricting the type of crops grown with wastewater is another way to protect consumers. However, such restrictions may not be enforceable in many countries. Promoting the production of high-value, non-food crops, such as ornamentals, flowers and agroforestry, may be a

Total cost and gross margin (US$/ha) for a wastewater farmer and regular canal water farmer in Haroonabad, Pakistan



Factors that contribute to higher gross margins for wastewater farmers include savings in fertilizer costs, a higher cropping intensity and the ability to grow higher-value crops.
Source: Water Policy Briefing 9

more effective option than overt restriction. In Hyderabad, India, farmers use wastewater to grow jasmine, not because of any restrictions, but because it is profitable. Helping farmers access the necessary inputs, extension and market linkages can encourage them to make the switch to non-food crops.

The Pakistan study suggested that by mixing wastewater with canal water, irrigation agencies could reduce the amount of excess nutrients deposited on fields and help extend the benefits of wastewater to more farmers. "Irrigation agencies, extension providers, health departments and water user associations all have potentially big roles to play in making this a safer, more beneficial practice," says Ensink.

Related reading:

- Water Policy Briefing 9: *Confronting the Realities of Wastewater Use in Agriculture*
- Research Report 64: *Use of Untreated Wastewater in Peri-Urban Agriculture in Pakistan: Risks and Opportunities*
- Research Report 63: *Urban Wastewater: A Valuable Resource for Agriculture: A Case Study from Haroonabad, Pakistan*
- Research Report 41: *Urban-Wastewater Reuse for Crop Production in the Water-Short Guanajuato River Basin Mexico*

See the resource area on wastewater reuse at www.iwmi.org/health for access to these publications and more.

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Bright spots...

three different types of 'bright spots'—a 'community' bright spot, where rehabilitation targets a variety of stakeholders that share the same resources; a 'technology' bright spot where a single technology is introduced to improve a production system; and a 'spontaneous' bright spot where success is achieved by using existing resources.

IWMI and its partners have studied over two hundred bright spots. The research is looking at both local and regional impacts, and seeking to understand how small-scale successes can be spread to impact positively on regions as a whole. The research will support the work of governments and NGOs through the provision of research findings and information on land and water management.

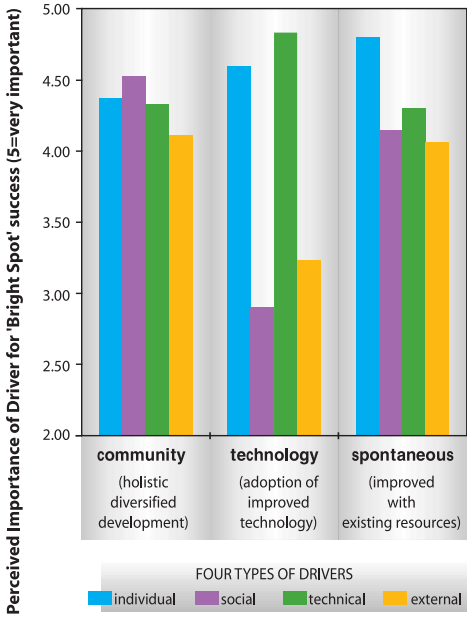
What determines success?

Through observation and farmer surveys, researchers have outlined a number of bright spot success factors. These include innovation and appropriate technologies, market opportunities, and individual aspirations and leadership (see figure).

Highlighting a project in northeast Thailand where farmers have reversed degradation by applying clay-based material to soil (see box), research partner Prof. Sawaeng Ruaysoongnern of Khon Kaen University, Thailand identified the importance of strong leadership. Says Ruaysoongnern: "With farmer-based networks, smallholders have developed integrated farming systems that have enabled farmers to repay their debts, become economically self-sufficient, and establish conservation-based farming systems. A key factor has been strong leadership skills demonstrated by individuals, and development from the bottom-up."

Similarly, research in Uzbekistan has shown that the leadership and innovation of cooperative farmers was a decisive factor in attempts to boost productivity and overcome the obstacles of water scarcity and the country's aging Soviet-era irrigation infrastructure. Through the application of innovative practices such as dry furrows, shorter furrows, and the reuse of drainage water, average yields on trial land increased by 15 percent.

Three Types of 'Bright Spots'



Ensuring sustainability

There is a risk that developing 'bright spots' could result in critical trade-offs. The more powerful and influential members of a community could take over the assets arising from any improvements in productivity, for example. Emphasis should therefore be on poorer farmers, and using only those resources already at their disposal. "The question we have to ask ourselves is to what extent farmers can improve food production with low-cost and locally available technologies and inputs," stresses Prof. Jules Pretty of the University of Essex, UK who is partnering IWMI in the bright spots research.

For more information on the Bright Spots initiative visit: www.iwmi.org/brightspots

New Partners are welcome. Contact d.bossio@cgiar.org

Improving Soil Quality with Kitty Litter

The light-textured sandy soils of northeast Thailand have a poor nutrient and water-holding capacity. Depleted by intensive cultivation for the export of agricultural products, the region's soils have suffered extreme degradation. Recent research, however, has uncovered practical ways to reverse this degradation. The application of bentonite clays—widely available in products ranging from drilling muds to kitty litter—has increased the fertility status of the soil and improved its water-holding capacity. "We have found that even with modest inputs of these clays we are seeing significant improvements in agricultural productivity," says Dr. Andrew Noble of IWMI.

This research was a collaborative effort with Thailand's Khon Kaen University and Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) with funding from the Australian Centre for International Agricultural Research (ACIAR).

Partners

Bright Spots research has received support from the Rockefeller Foundation and the Comprehensive Assessment of Water Management in Agriculture.

Collaborators include:

- Centre for Environment and Society, University of Essex, UK
- Centro Internacional de Agricultura Tropical (CIAT), Colombia
- Institut de recherché pour le developpement (IRD), France
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India
- Khon Kaen University, Thailand
- Mekelle University, Ethiopia
- Plant Research International, Netherlands
- Tamil Nadu Agricultural University, India

Taking Advantage of the Energy-Irrigation Nexus

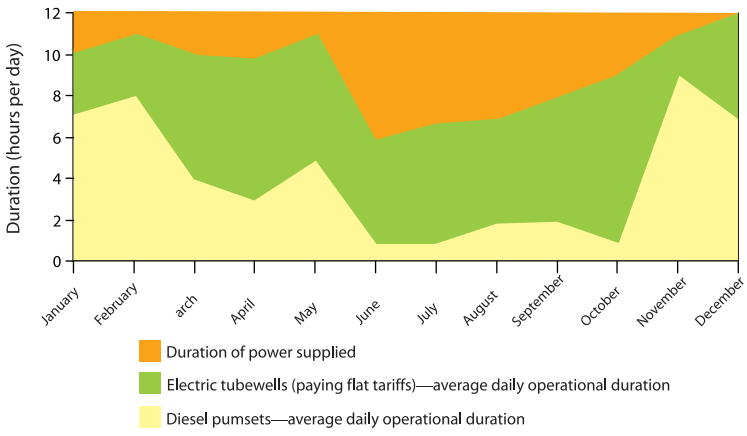
Can a more rational approach to agricultural power supply save South Asia's dwindling groundwater resources? IWMI research supported by USAID's Water-Energy Nexus Activity (WENEXA) and the Sir Ratan Tata Trust suggests yes.

Recent research suggests that a rational power supply and pricing policy for pump irrigation could be a powerful tool for the indirect management of both groundwater and energy use–if the two sectors can work together to take advantage of this opportunity.

A short-run solution: The rational flat tariff

IWMI research instead proposes a *rational* flat tariff, which is based on pump capacity rather than metered consumption of power. This approach greatly reduces transaction costs and does not face the strong farmer opposition that metering does. The flat-tariff option has been largely ignored because, in its current incarnation, it has proved a complete failure. Paying a flat rate for an almost unlimited supply encourages consumers to maximize consumption, often wastefully. But, combined with intelligent power supply rationing, it is a logical, viable alternative. Estimates suggest that this approach would cut wasteful groundwater use by 12-18 km³ per year in Western and Peninsular India alone, and reduce energy use in groundwater extraction by some 2-3 billion kWh, valued at Rs. 4,000 to 6,000 crores (US$0.8 billion to 1.2 billion) per year.

Average daily pumping hours, electric and diesel pumpsets



Maintaining 12 plus hours of daily power supply to the farm sector leads to wasteful use of power and water under a flat tariff regime, according to a 2002 IWMI survey of 2,234 tubewell irrigators across India and Bangladesh. A more sustainable option would be to cut the number of hours of electricity supplied and match power supply more closely to farmer needs—using the pumping patterns of diesel pump owners as a guide.

Source: Water Policy Briefing 10

Restricting power supply

An effective way of implementing the flat tariff would be to gradually raise tariffs to cut power utility losses. Effective supply rationing can be achieved by restricting the annual supply of farm power, but ensuring this supply when farmers need it most. "A state like Gujarat does not need to supply 3,000 hours of farm power per year," says Dr. Tushaar Shah, leader of the IWMI-Tata Water Policy Program. He adds: "It can make its farmers happy–and cut losses–by supplying power for only 1,200 hours, provided that those 1,200 hours of power are made available when most needed. Failure to sufficiently manage supply can be fatal under flat tariff; and result in de-electrification of a whole region's countryside, as in Eastern India."

3 Steps to More Sustainable Use of Power and Water

1. *Supply farms with fewer hours of power per year*, but ensure high-quality power-supply when farmers need it most.
2. *Increase the tariff*, though gradually and regularly towards covering the real cost of the electricity supply.
3. *Meter at the feeder level* to measure and monitor power use, to allow good management.

Drawbacks to metering

One solution, promoted by international donors and many state governments, is the metered tariff, which would involve the installation, maintenance and operation of farm-level meters. There are several obstacles to making metering work. One of the most difficult to overcome is the high transaction costs associated with metering and billing South Asia's 14 million scattered small-scale agricultural users. Even if the logistical problems are overcome, metering by itself does not necessarily save water–studies suggest that conservation measures are more a reaction to water scarcity than to high prices.

Making a power subsidy explicit is vital to effective management of the nexus. Presently, state governments provide a certain number of hours of electricity per day, but don't know the cost of that subsidy—which depends upon how many farmers pump during those hours, and for how long.

Why farmers favor a flat tariff

A further advantage of the rational flat tariff approach is that farmers support it. "Farmers like the flat tariff because it is simple and transparent, unlike metering," concludes Shah. "Farmers are against metering because it means the end of their power subsidy. Memories of corrupt meter readers in the 1980s are also still fresh in their minds. A flat tariff is a subsidy that reaches them directly–without being 'creamed off' by intermediaries."

Related reading:

- Water Policy Briefing 10: *The Energy-Irrigation Nexus*
- Research Report 70: *Energy-Irrigation Nexus in South Asia: Improving Groundwater Conservation and Power Sector Viability*

www.iwmi.org/waterpolicybriefing

Can Malaria be Controlled Without the Use of Drugs or Pesticides?

Malaria vectors are becoming increasingly immune to pesticides, and even drugs used to combat the disease are losing their efficacy. IWMI research in Sri Lanka and in East Africa shows that the incidence of malaria can be significantly reduced through environmental interventions.

In the past, communities used environmental interventions to control the spread of malaria. With the advent of drugs and pesticides, many of these practices have died out. But now we are facing a situation where many chemicals used to control vector breeding are losing their efficacy, and there are concerns over the serious health and environment risks of residual spraying programs. Recent research has demonstrated that environmental interventions may provide a more 'common sense' approach to controlling the spread of the disease.

Villagers in Sri Lanka cooperate to clear debris, such as fallen trees, rocks, branches and shrubs from streams, to eliminate the breeding habitats of malaria-carrying mosquitoes.

Eliminating natural breeding habitats

An IWMI study in Sri Lanka–a collaborative effort with Sri Lanka's University of Peradeniya, the Anti-Malaria Campaign, and the Mahaweli Authority–concluded that water management strategies were highly effective in controlling malaria vector breeding. Flattening and straightening streambeds, and removing silt deposits that have accumulated close to cross-sectional dams or the inner bends of rivers, help prevent the creation of shallow areas and pools with slow-flowing, almost stagnant water where mosquitoes can breed.

Dr. Eline Boelee, the IWMI Researcher who led the study says, "Sri Lanka's main malaria mosquito, *Anopheles culicifacies*, breeds in isolated, sunlit pools in streambeds. These pools are created by fallen trees, rocks, branches and shrubs that hang in the water, and also by sand mining which creates hollows in the streambed. If we clear this debris, we can largely eliminate breeding habitats."

After eighteen months, the application of these strategies with other measures such as the use of bed nets, reduced reported cases of malaria to 0 in study areas. Evidence suggests these interventions can be implemented in other arid and semi-arid areas such as Tamil Nadu in India. IWMI is currently two years into a monitoring program of a malaria intervention project in Yan Oya, Sri Lanka. The program concludes later this year.

Irrigation practices that fight malaria

In East Africa, IWMI research has looked at controlling malaria through the use of irrigation management practices. Of particular significance is the alternate wet/dry irrigation method. This approach, which involves the intermittent drying of rice fields, is effective in killing-off mosquito larvae. It has been applied in the Mwea Irrigation scheme through collaborative research by IWMI and the International Center of Insect Physiology and Ecology, Kenya, with support from the African Development Bank.

"Our research shows that this type of irrigation method has helped improve both the health and the economic wellbeing of communities in rice irrigation schemes," says Dr. Clifford Mutero, Leader of the Systemwide Initiative on Malaria in Agriculture (SIMA). However, Mutero also states that in the African context there are a number of problems that policymakers must first overcome if environmental interventions are to be more effective. One challenge is the fact that malaria vector systems in Africa are very complex, often involving several species–each with its own preferred breeding habitat. This makes malaria difficult to control using a single approach.

Addressing malnutrition

Since malnutrition generally lowers people's immunity to diseases such as malaria, the research in the Mwea scheme has also documented and assessed the scheme's mixed crop and livestock production systems, in order to identify opportunities for enhanced nutrition and income generation. "We would like to see more inter-sector partnerships which can provide a holistic approach to tackling malaria," says Mutero. "This is a pressing need, as rural communities are increasingly exposed to poverty, apathy and a lack of knowledge."

Related reading:

- IWMI Research Report 47: *Alternate Wet/Dry Irrigation in Rice Cultivation: A Practical Way to Save Water and Control Malaria and Japanese Encephalitis?*

  www.iwmi.org/pubs

Public awareness material shows villagers how some activities, such as removing sand from the stream bed, can create breeding habitats for malaria-carrying mosquitoes, and also how they can eliminate naturally-occuring breeding sites.

On-line Resources:

- **Controlling malaria through environmental interventions** includes lessons for South Asia, details of Sri Lankan case study, and downloadable community awareness materials in English, Sinhala and Tamil: *www.iwmi.org/malariacontrol*
- **IWMI's resource area on malaria and water management** provides information on the IWMI's malaria research program, access to publications and useful links: *www.iwmi.org/health*
- **The Systemwide Initiative on Malaria and Agriculture** provides information on SIMA research and partners and an electronic discussion and message board: *www.iwmi.org/sima*

Can Improving Water Use in Agriculture Save the Shrinking Aral Sea?

Water diversions for irrigation have caused the Aral Sea to shrink to 50 percent of its former size. Agriculture must consume less water if the volume of water in the sea is to be conserved. Recent research supported by IWMI and the Comprehensive Assessment of Water Management in Agriculture has demonstrated that improving the productivity of water in agriculture could offer fresh hope for the region.

Short furrow irrigation is one of the "best practices" identified by IWMI. It gives a better distribution of water and reduces deep percolation and runoff.

The Aral Sea region suffers from severe water stress and environmental degradation. The shrinking of the sea has killed a once thriving fishing industry and has resulted in salt-laden particles from the exposed sea bed falling on arable land and reducing crop yields–leading to food shortages, health problems and livelihood insecurity for the region's inhabitants.

Most of the water from the rivers that feed the Aral Sea, the Amu Darya and Syr Darya, is withdrawn for irrigation. "It is inevitable that agriculture must consume less water, if the volume of water in the sea is to be conserved or increased," says Mr. Iskandar Abdullaev, a Water Management Specialist with IWMI's Central Asia office.

Winning approaches to water savings

For the past three years, IWMI researchers, in partnership with the Scientific Information Center of the Interstate Commission for Water Coordination (SIC ICWC), have been exploring a range of options to save the Sea without hurting the region's farmers. The results of a recent World Bank-sponsored water savings competition and further monitoring of user-driven conservation efforts within the Syr Darya basin indicate cause for hope. IWMI and SIC ICWC scientists found that the basin-wide application of water conservation strategies could save as much as 36 km^3 of water per year. According to FAO data, this would be enough to stabilize the sea at its 1990 level, but would not address the continuing environmental degradation of the exposed sea bed.

Water savings practices evaluated include alternate wet and dry furrows, short-furrow irrigation, soil-leveling, and water "recycling"–capturing irrigation drainage water from the upper sections of a field and using it to irrigate lower sections. At the system-level, rehabilitating canal lining and installing equipment that regulates water use within irrigation systems have also proved to be effective options.

"For practices to spread," says IWMI researcher, Mr. Mehmood ul Hassan, "it's important that farmers understand how they benefit. It is encouraging that despite the current lack of financial incentives, the number of farmers continuing to practice water savings remains high." Mr. Zakir Aka, a farmer from the Ferghana Province explains, "We are beginning to realize that if we are careful with water and save it, we have more chance of maintaining our yields in times of drought."

Another option for increasing inflow into the Sea–albeit one that is less popular with farmers–is to take some of the saline, rice-producing areas out of production. IWMI research estimates the net cost of taking 132,000 hectares of salinized land out of production would be less than US$30 million, yet in terms of ecological value of the irrigation water saved, the benefits for the future of the Sea would be far higher.

Ensuring conserved water benefits the Sea

Researchers stress the need to impose restrictions on how the water that is saved in agriculture can be used. "There is a danger that the conserved water might be used to increase the irrigated area," says Abdullaev. "The risk in the Syr-Darya basin is that upstream savings will merely mean more water for downstream irrigators and not for the Aral Sea."

To ensure that irrigation and environmental water needs are considered in harmony, water management in the region needs to move from a sectoral approach, where water is managed along administrative boundaries, to an Integrated Water Resources Management (IWRM) approach, where water is managed along hydrological boundaries. In cooperation with Water Users Associations and the Ministries of Agriculture and Water Resources for Kyrgyzstan, Tajikistan and Uzbekistan, researchers are currently evaluating institutional reforms that incorporate IWRM principles. This work is supported by the Swiss Agency for Development and Cooperation (SDC).

Related reading:

- IWMI Research Report 67, *Water Productivity in the Syr-Darya River Basin*
- IWMI-CAC Research Report 2, *Best Water Conservation Practices and Their Impact on Water Productivity in the Syr-Darya River Basin*

www.iwmi.org/centralasia

New On-Line Resource to Support Irrigation Management and Food Security in the Aral Sea Region

Social Mobilization and Institutional Development Approaches for Central Asian Countries

With support from the Swiss Agency for Development and Cooperation (SDC), IWMI and its partners in the region—notably the Scientific Information Center of the Interstate Commission for Water Coordination and the International Fund for Saving the Aral Sea—have adapted lessons learned from the Institute's 15 years of research on water user associations to the Central Asian context. Guidelines and best practices to support the work of government agencies, NGOs and donors are available on a special Central Asia Water Users web page in Uzbek, Russian, Tajik and English. *www.iwmi.org/centralasiawaterusers*

Integrating Sustainable Livestock Management into Watershed Development

The Indian government, donors and NGOs have already invested over 2 billion US dollars (Rs 9,420 crore) in watershed development programs in an effort to improve livelihoods, reverse land degradation, and encourage sustainable management of natural resources. But by not taking smallholder dependence on livestock into account, these programs may be hurting the very people they seek to help. The Swiss Agency for Development and Cooperation(SDC) and the Food and Agriculture Organization (FAO) are funding research in India in an effort to identify strategic directions and policy interventions required to integrate livestock production into watershed management.

To date, watershed development programs have covered over 32 million hectares of India's countryside, roughly 45 percent of the country's rainfed agricultural land. And during 2002–2022, the government plans to cover 88.5 million more hectares, at a total cost of 1.6 billion (Rs 7,275 crore).

But, traditionally, these programs focus on land and water conservation and improving agricultural production, with no attention to sustainable livestock management. They fail to consider the range of needs livestock meet, especially for the poor–supplying farmers with food, transport, manure to fertilize crops and income from dairying, while acting as a form of insurance against unexpected disasters. As one farmer from the Ladki Nadi watershed in Madhya Pradesh put it, "We need our animals for drought periods and also to provide manure. Without manure, the crops remain sick. No amount of fertilizer will help. We can never give up animals even if income from crop production or other sources increases. This will only give us more means to acquire more livestock. They are our way of life."

Enforcement of a zero-grazing policy, which many watershed development programs demand in an effort to regenerate over-grazed areas, hurts the poorest of the poor who are dependant on small ruminants, such as sheep and goats. Without access to grazing land, these people are often forced to sell their animals—to the detriment of their livelihoods and food security. Other options such as rotational grazing are more pro-poor and have the added bonus of adding nutrients back into the soil.

The knowledge gap

Part of the problem is lack of knowledge–there have been no comprehensive studies on the interaction between livestock, watershed environment and livelihoods. "We're taking the first step in remedying a very real and pressing lack," says Ms. Ranjitha Puskur, the IWMI scientist leading the research. "Unfortunately, because of a greater focus on grain production for food security, there has been no meaningful policy or applied research to improve sustainable livestock production in India. The rapid depletion of natural resources, a growing population, and unsustainable livestock development have seriously effected poor, marginalized communities, especially women, who depend on animal husbandry for their livelihoods."

The IWMI project is looking at how livestock influence livelihoods and environment and how watershed development programs are influencing all three factors, in both the short and long-term. The goal is to help governments and NGOs better integrate livestock considerations into the design and implementation of watershed development and management programs. The project contributes directly to LEAD (Livestock, Environment and Development)–an initiative established by FAO to provide policymakers with tools and practical knowledge to tackle livestock issues.

Key questions

NGOs have played a central role in the watershed development movement in India and are also playing a central role in the research. "We are focusing on the questions that people who are implementing these programs on the ground would like to have answers for," says Puskur. "NGO partners helped shape the research agenda and are carrying out much of the data collection. Communities and government departments are actively involved through local project monitoring committees."

The project focuses on five water-scarce watersheds in semi-arid India, representing different combinations of biophysical and market access conditions. The project is creating a database of biophysical information for NGOs and government agencies in the study watersheds and is providing training to NGOs in ongoing monitoring and data collection, as well as in using data for planning.

Researchers are using primary hydrological data and GIS/Remote Sensing to determine the biophysical characteristics of the watersheds and interactions among water, land, vegetation and livestock–with the aim of determining how different types of interventions have impacted these interactions and how to determine "carrying-capacity" potential of watersheds in reference to livestock. PRAs and questionnaire surveys are helping researchers to understand the contribution of livestock to household incomes, how open-access grazing areas are managed, and how access to markets, credit, capacity-building, and institutional arrangements effect the equation. Results of the project will include policy implications and strategies and tools for NGOs and communities. The 24-month project will end in September of 2004.

For more information on LEAD, see www.virtualcentre.org

For more information on IWMI's activities in India, see www.iwmi.org/southasia

Partners

- Capitalization of Livestock Programs in India (CALPI)
- Food and Agriculture Organization of the United Nations (FAO)
- Samuha
- Sampark
- Sevamandir
- Watershed Organization Trust (WOTR)
- Watershed Support Services and Activities Network (WASSAN)

Nairobi Conference Sets Future Path for the Challenge Program on Water and Food

At a five-day meeting the CGIAR Challenge Program on Water and Food gathered scientists, policymakers and interested groups from around the globe to debate water, food and environment challenges, and to set the Program's research agenda for the coming years. Results of the one-year inception phase of the Program were presented, and guest speakers from a range of organizations including the International Federation of Agricultural Producers (IFAP), the Food and Agriculture Organization, and the World Conservation Union (IUCN) were invited to participate in high-level policy debates.

For more information, visit: www.waterforfood.org

Recent Water Policy Briefings

IWMI has continued to contribute to the *Water Policy Briefing* series, providing new perspectives and solutions to water problems in the poor south. Recent issues deal with the controversial topics of:

Wastewater irrigation (Issue 9): What policymakers need to know about the risks and the benefits (see article page 1)

Agricultural power supply (Issue 10): Flat vs. metered tariffs; which provides the best solution for shrinking aquifers and ailing power utilities in South Asia (see article page 4).

Irrigation management transfer (Issue 11): Is it a death-sentence for many of Africa's smallholder schemes?

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