University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Office of Research and Economic Development--Publications | Research and Economic Development, Office of

1-1-2009

Use of Water for Agriculture in Pakistan: Experiences and Challenges

Simi Sadaf Kamal
Hisaar Foundation

Follow this and additional works at: http://digitalcommons.unl.edu/researchecondev

Part of the Higher Education Administration Commons

Kamal, Simi Sadaf, "Use of Water for Agriculture in Pakistan: Experiences and Challenges" (2009). *Office of Research and Economic Development--Publications.* Paper 12.
http://digitalcommons.unl.edu/researchecondev/12

This Article is brought to you for free and open access by the Research and Economic Development, Office of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Office of Research and Economic Development--Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Use of Water for Agriculture in Pakistan: Experiences and Challenges

Simi Sadaf Kamal
Chairperson and Chief Executive
Hisaar Foundation

Simi Sadaf Kamal's 28 years of experience with water, environment and food security issues in Pakistan enable her to provide an in-depth look at the history of water and food production initiatives and institutional and legal frameworks and policies in her native land. As chairperson and chief executive of Hisaar Foundation, which promotes creative low-cost solutions and policies to address food, livelihood and climate change issues in Pakistan, Kamal speaks with authority on the benefits and costs of past initiatives and actions and the challenges involved in managing water to achieve food security.

Simi Sadaf Kamal

"If you look at Pakistan from space, you'll see this green kind of dragon moving down," Simi Sadaf Kamal said, "and that green would not have been possible if we did not have irrigation and irrigation-based agriculture." Ninety-two percent of Pakistan's land area is arid or semi-arid, yet about 25 percent of Pakistan's gross domestic product comes from agriculture. Most of Pakistan's irrigated agriculture is in the Indus Plain, which comprises about 25 percent of the country's total land area. The 85 percent of the cultivated area in the Indus Plain that is irrigated, indicated by the green area on the image from space, produces 90 percent of Pakistan's food and fiber requirements. (See page 41.)

History of water resources development in Pakistan

Kamal spoke about major events that shaped the recent history of water resources development in Pakistan. The early emphasis on technological advances in the 1960s changed to an increased focus on governance based-reforms, indicating changing trends in how Pakistan deals with water-related issues.

The Indus Waters Treaty. The Indus River Basin, which spans India and Pakistan, has often been the subject of disputes between the countries. In the 1960s India and Pakistan signed the Indus Waters Treaty. Although often criticized as unfair to Pakistan, the treaty has enabled water managers to meet and resolve water issues, even when the two countries were at war. The Indus Basin supports the largest contiguous irrigation system in the world. Started when Pakistan was under British rule, the system has expanded over the last 60 years to include three large dams, 16 barrages, check dams to raise the height of water in the canals, 56,000 kilometers of large inter-linked canals and 1.6 million kilometers of other canal systems that provide irrigation water to 36 million acres (14.56 million hectares). Water distribution in India and Pakistan is based on a system of water scheduling that takes into account the variability of supply each season.

© 2009, The Board of Regents of the University of Nebraska. All rights reserved.

The Green Revolution. The Green Revolution in Pakistan during the 1960s and 1970s introduced new high-yielding varieties of wheat, including the MexiPack cultivar, and 80 improved varieties of rice. Mechanization, water resources development and fertilizer and pesticide use also increased. As a result, wheat and rice production doubled and agricultural production as a whole grew at a rate of 6 percent. Western Pakistan became self sufficient in food grains and began to export rice, although eastern Pakistan, which became Bangladesh, still is not self-sufficient. Higher yields increased incomes. The implementation of price supports, favorable terms on trade, subsidies and credits also contributed to increased incomes.

From left: Roy Steiner, Jeff Raikes, Harvey Perlman, James B. Milliken

But the advantages brought by the Green Revolution were not sustained, Kamal said, in part due to the lack of change in other parts of the food production system. The use of inefficient flood irrigation methods continued, food storage capacity did not increase, farmers' ability to market their produce did not improve, agri-based industries did not develop, and the credits and subsidies benefited the landlords more than the landless sharecroppers who actually farmed the land.

In 1991 Pakistan signed the Water Accord, which divides water among Pakistan's provinces. Although India and Pakistan have been able to work together on water issues, within Pakistan much acrimony still exists over water management and allocation. For example, the Water Accord provides for a flow of 10 million acre-feet of water for downstream provinces, but this flow only materializes in flood years.

> *"The deficit in grain production in relation to population is predicted to reach 12 million tons by the year 2013."*

Kamal said only 45 percent of the cultivable land can be under cultivation at any given time because of a lack of water to keep canals running simultaneously. Thirty-eight percent of Pakistan's irrigated lands are waterlogged. Salt accumulation also has grown at an unprecedented pace. Fourteen percent of the croplands, including land in the Indus Valley, have developed high salinity, and salt intrusion into mined aquifers has increased.

From the 1960s until 2000, Salinity Control and Reclamation Projects, which often are cited as a good practice, reclaimed 18.3 million acres (7.40 million hectares), decreased the number of salt-affected areas and controlled waterlogging. In the reclaimed areas the crop yields increased, the socioeconomic status of the farmers' communities improved and the gross value of production on SCARPs-treated land was enhanced substantially.

Groundwater wells and conjunctive use with surface water. Increased use of groundwater wells also has contributed to higher food production. The Indus Basin has almost 55 million acre-feet of fresh groundwater supplies. Although groundwater quality is highly variable, use of wells has grown since the 1960s to more than 600,000 wells. Well use increased in part because the government made electricity available at low or no cost, and groundwater now supplies water for half of all irrigation requirements. "Anybody

who wants to can just go and start extracting water from aquifers because the electricity is so cheap, and this has contributed to the water problems in Pakistan," Kamal said.

The conjunctive use of surface water and groundwater has been hailed as a giant step forward in Pakistan, Kamal said, but there are indications of aquifer mining, which may become problematic because long-term use of groundwater may lead to secondary salinization. No one knows the extent of the problem because it's unclear how much salinity irrigated agriculture can tolerate in the long term.

Pakistan from space

Source: The World Bank Report, Pakistan's Water Economy: Running Dry, November 8, 2005, pg vii

Population growth. Pakistan's population of 165 million is growing fast. Rapid population growth coupled with a limited water supply is leading to increased poverty in Pakistan. Ninety-eight million people rely on agriculture for their income; 49 million earn below the poverty line; 54 million do not have access to safe drinking water; 76 million have no sanitation. "This is a very, very big challenge," Kamal said.

Water and food security for Pakistan in the 21st century

Providing sufficient water and food security in the 21st century are Pakistan's major issues. "The deficit in grain production in relation to population is predicted to reach 12 million tons by the year 2013," Kamal said. "That's not very far from now." According to the World Bank, Pakistan is one of world's most water-stressed countries. Irrigation canals work on rotation because there is not enough water to operate them simultaneously, and two-thirds of the water in canals is lost through seepage. The storage capacity of reservoirs is very low; Pakistan can store only a 30-day supply.

"Pakistan is already using 97 percent of its surface water resources and is mining its groundwater to support one of the lowest productivities in the world per unit of water and per unit of land, however you compare it," Kamal said.

Today the river bed of the Indus River downstream from the Kotri barrage, the last big infrastructure on the river before it reaches the sea, is dry 11 months of the year. "I have been there and I have shed tears because the River Indus is about a mile across at that place, and there is not a drop of water," Kamal said. Only one out of the 17 creeks of the Indus Delta is active. The seawater intrusion into the freshwater zone has extended far inland, the tidal zone is very heavily disturbed and the world's sixth-largest mangrove forest is being seriously impacted.

Lack of recognition of the value of water. Yet even under these conditions, people take the value of water for granted. Although there is some recognition that water has value, the common perception does not include an awareness that irrigation water and water for other uses is being provided far below its economic value. "The common perception says that you shouldn't have to pay for water. Water should be free. It is God's gift to mankind," Kamal said. She agreed with Peter Rogers that setting water prices at their full socioeconomic cost must be a top priority. This would be a real challenge for Pakistan, she added.

Lack of maintenance for water infrastructure. The financing of water services in Pakistan is dismal, Kamal said. The general taxpayer pays the interest on the investment made in water infrastructure; no one pays to replace dilapidated infrastructure. The actual users, the farmers, pay only a small fraction of the operation and maintenance costs. In addition, added Kamal, operation and maintenance is poor because the government manages irrigation services and many politicians award service jobs to their supporters. Therefore, the infrastructure is in very poor condition.

When new irrigation canals were built a century ago, they were designed to have parallel drainage canals to remove excess water from irrigated areas. The drainage canals were never built. Years later, a series of drainage projects designed to remove saline water from these irrigated lands were poorly built and increased the seawater intrusion. After an inspection of these projects, the World Bank concluded that poverty had actually increased in the coastal areas.

"A real paradigm shift is required to reframe the whole discourse on water for agriculture."

Inequitable water distribution. Even in water-rich areas such as Punjab, an upstream province with an adequate water supply, not everyone gets water; and in the downstream province of Sindh, where water supplies are short, not everyone is deprived of water. Both provinces face the same challenge of providing an equitable distribution of water. "But if you pick up a Pakistani newspaper, most of the time the water reporting is about dams and about water sharing between the two provinces of Punjab and Sindh," Kamal said. "Some of us are involved in very heavy advocacy to get people to think about water in different ways, to look at water more holistically and to grow out of only political discussions in terms of water sharing amongst the two bigger provinces."

In Pakistan land ownership is a proxy for water rights; the amount of land someone owns determines how much water he or she gets. Landless people, including farmers who are responsible for managing irrigation water, have no water rights. Because few women own agricultural lands, they have very little voice in how water is distributed. Therefore, the benefits of irrigation infrastructure and rehabilitation have directly enriched the landowners. Land values have increased about 30 percent in the past decade, and these landowners are likely to continue receiving the lion's share of the benefits of low water charges and infrastructure improvement, Kamal said.

Pakistan water policy. It is the landowners, with little incentive to adopt water conservation methods, who are sitting in parliament, Kamal said. This has resulted in a lack of a comprehensive set of water laws that define water rights and uses. The principles of water pricing are absent and the basis on which subsidies are given is unclear. Pakistan does not have policies to promote water conservation or assess polluter penalties.

Pakistan is attempting to develop a water policy, but the policy has had successive drafts from 2000 to 2006, and with each draft, the conservation policies have decreased. Other policy efforts include a Pakistan water resources strategy produced by the Ministry of Water and Power; a vision document by the powerful Water and Power Development Authority; a water strategy produced by the ministry; and a medium-term development framework that addresses water but has never been finalized because the two biggest provinces, Punjab and Sindh, cannot agree.

Provincial Irrigation and Drainage Authorities. In recent years, Pakistan has moved toward reform-based good practices. The irrigation drainage sector reform, supported by the World Bank, is still followed in parts of the irrigated areas in Punjab and Sindh. Reforms have combined irrigation and drainage functions into single Provincial Irrigation and Drainage Authorities (PIDA) supported by the Water Management Ordinances passed in 2002.

The PIDAs are supposed to operate and maintain the main canals, branch canals and drainage systems, and manage the flood protection infrastructure within the command areas. These authorities will eventually take over the rehabilitation and maintenance of 10 canal command areas. While this is encouraging, Kamal cautioned that operating and maintaining the barrages and outlets assigned to each PIDA is a big job. Under the PIDA are Area Water Boards, which divide the irrigation system into manageable chunks. Each Area Water Board has a number of Farmers Organizations and Water Course Associations – an effort to make management of the water system more transparent.

The PIDA is supposed to promote Farmers Organizations, which are the linchpin in this system. These organizations operate and maintain the irrigation system associated with their canal and are responsible for ensuring equitable and judicious distribution of water, including water for small and tail-end farmers, and non-agricultural and domestic water users. The Farmers Organizations also are supposed to guarantee a minimum drinking water supply and provide flood protection.

Kamal pointed out that the ordinance governing these organizations defines a farmer as someone who owns land. The farmers who actually work the land, handle the water and grow the crops usually do not own the land. They are not very committed to the system because they're left out.

Rawal Dam, Pakistan

Can Pakistan meet its water and food production challenges? Kamal says yes. "We can meet some of these challenges but not through business as usual. Not through what we have in place. A real paradigm shift is required to reframe the whole discourse on water for agriculture."

Kamal believes Pakistan must address the fundamental issues of land and water rights. Land reform is critical. Developing land holdings of more or less the same size and establishing a society that is more socially and economically homogeneous would increase productivity and equity and reduce poverty. There has been tremendous progress in areas of Pakistan dominated by medium-sized farms. This rapid rate of progress is partly because the farmers in the Farmers Organization are peers, providing a balance of power that is not possible in Farmers Organizations in which most of the farmers are landless. Kamal recognizes that achieving more inclusive land reform will be very difficult.

Kamal also sees the need to shift from focusing on the provincial distribution of water for agriculture, as in the Sindh-Punjab debate, to developing a comprehensive, better-managed water use program in irrigated and rainfed areas for all of Pakistan. There are

large rainfed areas in Baluchistan and in the North-West Frontier Province, Kamal said, but they don't get needed support for agricultural development because this is the area where many of the so-called terrorist activities are happening.

Managing water demand. "We feel that there needs to be more of a focus on managing water demand. We have to stop people from asking for more and more water when there is no more water in the system to be mobilized," Kamal said. She explained that the argument for more irrigation infrastructure is based on an uncritical capitulation to the demand for more irrigation water for agriculture even though there is no more water in the system. Agriculture already absorbs 97 percent of the total mobilized surface water and almost all of the groundwater used in the country. "We need to unpack this demand and then go on a very strong advocacy trip to make people understand that we don't need to have more water to improve agriculture production, that better management is where we need to go," Kamal said.

"There needs to be more of a focus on managing water demand. We have to stop people from asking for more and more water when there is no more water in the system to be mobilized."

Kamal listed the key steps for moving Pakistan forward.

- Divide the Indus Basin into agro-climatic zones and develop long-term water strategies and crop combinations for each zone.
- Improve agricultural practices and technologies to produce more crop per drop.
- Where feasible, rehabilitate and better maintain existing irrigation infrastructure.
- Improve micro-irrigation techniques. The Hisaar Foundation believes women are key to improving water management at the micro level and has developed the idea of establishing a women's water network. An existing program trains people, especially women and children in urban and rural areas, to grow crops on rooftops to achieve food security for their families, and then links them to a microcredit source after three to eight years. The program was so successful that about 25 percent of the women were already linked into microcredit after the first training.
- Aggressively promote water conservation.
- Rehabilitate the freshwater-seawater interface on coasts.
- Adapt to climate change.

"Now, these steps may seem to be hard, but they're really not that hard. It is a matter of changing mindsets," Kamal said. "If we can be strategic, if we can be innovative, then we can move forward."