INSTITUTIONAL REQUIREMENTS FOR EFFECTIVE WATER MANAGEMENT

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Summary

Water management institutions require radical reform if they are to meet the challenges facing them during the next few decades. The challenges include increasing food production from irrigated agriculture to meet growing demand, coping with escalating water demands in other sectors, sustaining the quality of soils and water, and improving the equity of water distribution. The five most important institutional changes required are: replacement of administrative with service delivery organizations; conversion of irrigation systems into multi-use water service systems; transcending the infrastructure dependency—deterioration trap; establishing legal and regulatory frameworks for sustainable water management; and implementing integrated water basin management. The central challenge will be to design institutions that ensure accountability of water service providers to users. Effective, sustainable, and integrated water management in the future requires putting in place the new institutions to ensure that the world can meet the twin imperatives of dramatically increasing the productivity of water and halting water-related environmental degradation.

1. Introduction

During the first three decades of the twenty-first century, the world's population is expected to increase by approximately 90 million people per year. Most of this growth will be in developing countries. By 2025 world population will approach eight billion. The impact of this rapid population growth on demand for food will depend on the purchasing power of the poor. The International Food Policy Research Institute (IFPRI) forecasts that effective demand for foodgrains in developing countries will increase by 75 percent between 1990 and 2020, and for livestock products 155 percent.

Further, there is growing concern about the extent and rate of soil degradation and depletion of water supplies, and how this may affect the capacity to meet rising food demands. Much of the degradation is occurring in "breadbasket" irrigated agricultural areas of the world, largely due to both salinization of soils and mining of groundwater. Population growth, and with it the need for water for a variety of purposes including agriculture, industry, and domestic uses, is expected to result in a 650 percent increase in the demand for water over this time.

In the first three decades of the twenty-first century approximately 80 percent of the additional required food supply will have to be produced on irrigated land. For example, experts predict that one-half of the increased demand for food in China in that time must come from improvements in the productivity of existing irrigation systems, much of which will depend on improved water management. In developing countries about 70 percent of accessible fresh water is used for agriculture. However, this figure is somewhat misleading in that water diverted into irrigation systems is often used for multiple uses, including aquaculture, livestock, domestic uses, small-scale rural industry, and recreation. Industrial nations use about 40 percent of freshwater supplies for industry, versus only 10 percent in developing countries. The processes of development, economic diversification, and population increases in less developed countries are creating increased demands to reallocate water away from agriculture to industry, energy, and urban uses.

The total supply of water available for human use is basically fixed. Therefore, probably the most profound challenge facing world agriculture is how to produce more food with less water. Research by the International Water Management Institute (IWMI) and others has shown that in many parts of the developing world, particularly in the Middle East, Sub-Saharan Africa, and parts of Asia, the demand for water will exceed the supply. Indeed this has already occurred in many river basins, leading to a reduction in irrigation and threatening food security.

The challenge becomes even more daunting when it is taken into account that in the most populous and poorest regions of the world, especially in Asia, groundwater is fast surpassing surface water as the principal source of irrigation as well as domestic water supply. For example, over half of India's food production is based on groundwater irrigation through over 20 million tubewells. Groundwater irrigation through private tubewells is rapidly becoming the mainstay of irrigated agriculture in Pakistan, Bangladesh, and China. Throughout the world, developed as well as developing, groundwater meets over 80 percent of urban domestic water demand. However, compared to surface water, groundwater development suffers from a nearly total institutional void, with little systematic planning and management. The consequences of this free-for-all are becoming all too evident. Peninsular and western India, Punjab and Sindh in Pakistan, all of the North China plain, and many regions of the developed world too are over-pumping groundwater aquifers in a manner that is not sustainable for much longer.

The primary challenges in the water sector of developing countries are, and will be, how to cope with the rising competition for water between multiple kinds of users in ways which are equitable, efficient, and sustainable; and how to increase the productivity of water—getting more crop per unit of water consumed—as water becomes more scarce. These challenges are particularly daunting for developing countries with limited financial resources and weak civic institutions, because poor and disadvantaged people are likely to suffer disproportionately from scarce and polluted water supplies.

This article discusses what are believed to be the five most important changes required in the water sectors of developing countries in the twenty-first century. These are:

(i) replacement of administrative with service delivery organizations
(ii) conversion of irrigation systems into multi-use water service systems
(iii) transcending the infrastructure dependency--deterioration trap
(iv) establishing appropriate legal and regulatory frameworks, and
(v) implementing integrated water basin management.

The consequences of not coping effectively with these challenges are dire. But coping with them effectively will require fundamental changes in the nature of water sector institutions in developing countries.

The article is based largely on work done by the International Water Management Institute (IWMI), formerly known as the International Irrigation Management Institute (IIMI), and its partners over several years. The critical lesson emerging from this research is the need to broaden from a focus on irrigation systems to an integrated land and water management perspective at the river basin level.

2. From Administrative to Service Delivery Organizations

It is well known that a multitude of technical solutions to problems of irrigation management have been recommended and tested in pilot projects only to be ignored, abandoned, or even sabotaged at the stage of adoption or attempted incorporation into routine management. These include such things as automated water control systems and devices, advanced information and accounting systems, scientifically elegant Operation & Maintenance manuals, remote sensing and Geographical Information Systems applications, water conserving technology, public tubewells, drainage systems, and so on. And yet, partly because of the “law of the hammer” (a phrase coined by social theorist Abraham Kaplan referring to the tendency of people trained in a particular discipline or skill to think that nearly every problem needs the solution that they are trained to provide) and a coincidence of vested interests, the technical solutions continue, unabated, to be promulgated.

One example is waterlogging and salinization in irrigated areas. Technical solutions to these problems have been known and recommended by technical experts for many years. But salinization continues to advance in many countries, especially in Pakistan, India, Iran, Iraq, and northern China. The Food and Agricultural Organization of the United Nations (FAO) has estimated that of the world's 270 million hectares of irrigated land, 20–30 million ha are severely affected by salinity while another 60–80 million ha are affected to a lesser extent. Waterlogging and salinity continue to reduce the productivity of irrigated farmland or take land out of production altogether. The process continues while recommendations about sound water delivery and application practices are ignored, investments in needed drainage infrastructure are not made, and existing drains are not maintained.

A study of salinization in a large-scale public irrigation scheme in Turkey concluded that the cause of salinization and its continuing advance is an institutional failure, not a lack of technical solutions. Existing public agencies and farmer organizations lack adequate systems of incentives, accountability, inter-organizational coordination, and internal cooperation to enable them to deal effectively with salinization.

Another well-known example is mal-distribution of water within irrigation systems, especially between head and tail ends. This is endemic in large-scale canal irrigation systems, especially in South Asia, where hundreds of thousands of irrigable hectares fail to receive surface irrigation water because of capture of excessive amounts of water by `head enders' or politically powerful farmers. Rent-seeking, low-paid civil servants are often easily drawn into systematic patterns of misallocation. Even where there is little corruption, public agencies lack the incentive systems for field operations personnel to ensure that performance standards are met. Generally, neither the budget nor the personnel of a public bureaucracy are dependent on achievement of performance targets. Sanctions are rarely applied against farmers who violate official water distribution rules, either because such farmers are powerful, or because farmer groups or village governments are too weak to impose sanctions.

While recommendations and pilot efforts have sought to create farmer organizations and improve water control, these have generally been resisted or implemented half-heartedly by government irrigation agencies. Far more resources and efforts have been invested in improving infrastructure and technology and introducing advanced information and control systems than in creating effective farmer organizations and reforming public agencies.

There are other areas where lack of a performance-orientation in public bureaucracies and even farmer organizations has seriously undermined management performance, such as indiscriminate or deferred maintenance investment, inefficient financial management, failure to recover water charges, faulty rehabilitation and modernization projects, and so on. However, there are two challenges where performance-oriented management will be particularly important in the future. These are:

- increasing the productivity of water, and
- halting or reversing environmental degradation.

Heretofore, the emphasis in agricultural development has been on improving productivity per unit of land. In the future the main constraining resource will increasingly be water, so that agricultural productivity per unit of water will be the key concern. Future irrigation organizations will have to be made accountable for how much water they deliver and how productively their customers are able to use it. They will also have to be made accountable for halting or reversing environmental degradation. Clearly, centrally-financed bureaucracies in developing countries are not generally accountable to such performance objectives. New kinds of organizations will have to emerge. The following are some of the required changes:

(a) Water service entity budgets must become primarily dependent on delivering water in accordance with service agreements with organized bodies of water users, based on meeting the objectives of water distribution equity, water productivity, and environmental conservation;
(b) after basic needs are met, tradable water rights should be established where feasible, to support a system of economic valuation to progressively allocate water toward higher value or more productive uses;
(c) incentive systems for water service entity staff will be required to encourage staff to advance these objectives;
(d) the costs of negative environmental externalities caused by irrigation systems should be accounted for and internalized in water service entity costs.

These features are rarely found in public agencies. Many of them are found, to some degree, in autonomous public utilities, semi-municipal irrigation districts, and mutual companies. The water and soil associations and drainage societies in Europe and Japan and irrigation and drainage districts in North America exemplify, to a great extent, the kinds of incentive and accountability arrangements needed in the future. Such arrangements would ensure that water service entities promote higher productivity of water, subject to requirements for environmental conservation. The emerging Chinese models of stock shareholding water rights, financially autonomous districts, and competitive contract management are also progressive in this sense. Strong political commitment, organizational creativity, experimentation, and cross-national learning will be needed to bring about the kind of institutional evolution which will be required.

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Biographical Sketches

Doug Merrey is the Deputy Director General (Programs) at the International Water Management Institute (IWMI) whose headquarters in are in Sri Lanka. He holds a Ph.D. in Social Anthropology from the University of Pennsylvania, USA, and specializes in research on institutional and policy reform in the water resources sectors of developing countries. Dr. Merrey has been at IWMI nearly continuously since 1985, and has previously led the program on policies and institutions, and the country programs in Sri Lanka and Egypt. Currently, he is based in Pretoria, South Africa, where he is now Director for Africa.

Doug Vermillion holds a Ph.D. in Development Sociology from Cornell University, USA. His expertise is in policy and institutional reform in the water sectors of developing countries. Dr. Vermillion worked for 12 years with the International Water Management Institute, in Indonesia and Sri Lanka, leading the well-known work the Institute has done on irrigation management transfer. He has also carried out short-term research, training and technical assistance in various countries in Asia, Africa, the Middle East, and Latin America. Until recently he was working as an independent consultant, based in Spokane, Washington, USA. He is rejoining IWMI in January 2002.

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