Africa — Farmers facing sudden need to take over management of components of large irrigation schemes.

Irrigation Management Turnover: Structural Adjustment or Strategic Evolution?

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Stakeholders

Early in the morning, Mr. Anwar picked up his hand hoe and satchel and was headed out the door when his wife called from the back of the house, "Why aren't you taking the children with you?"

"Because I'm going to the canal, not the field," he answered. "Transplanting will have to wait three more days. At the meeting last night all the farmers sharing water from the canal were told that the government will no longer clean the canal or distribute the water to the field turnouts. So we decided not to start the season until the entire canal is cleaned out. Maybe this will mean we will get our water when we need it."

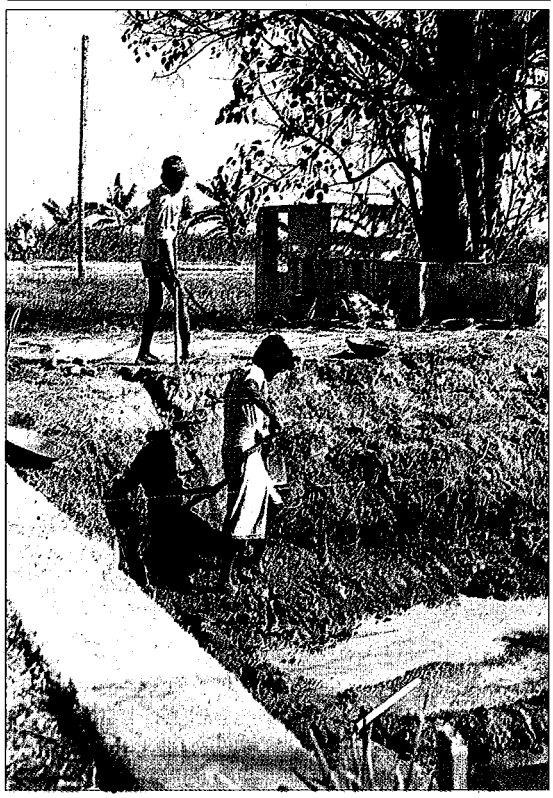
As he walked along the path he wondered if he would get a better crop as a result of the extra work. He also wondered if the more prosperous farmers at the top end of the canal would show up for the canal cleaning.

Mr. Helmi handed his boss, the Irrigation Supervisor, a cup of tea and said, "I've been taking silt, garbage and weeds out of the canal for you for ten years now. To supplement my pay, my family runs a small shop next to the canal. How can I send my daughter to school if I am discharged from the service?"

"Perhaps we can arrange to transfer you to work on the main canal," said the Supervisor, "where management is not being turned over to the farmers. Of course you would have to leave the shop behind," he said. "This could be difficult to arrange though, since we are supposed to cut back on staff and you are not a civil servant. Maybe the new farmers' association would hire you."

"I don't even know what's happening with my own job, you know. They want me to pass on the maintenance work and gate operations to the farmers. How am I going to do that?"

In a somewhat unsettling meeting with the Directors of the Irrigation and Agriculture Departments, Mr. Savas from the Finance Department explained the implications of the structural adjustment policy on their budgets. They would be cut. Some staff would have to be released or redeployed. Substantial agricultural subsidies and price supports would be history. Some sub-sectors, such as agricultural credit and irrigation management, must become completely self-financing. "Let's face it gentlemen," said Mr. Savas, "the irrigation systems are too high a burden for the government to pay, and are under-performing even so. Maybe the farmers are ready to take over some or all of the management. Certainly the government is ready to privatize."



Asia — Farmers invest in canal maintenance.

In a meeting with his deputy directors later that day, the Director of Irrigation explained his views.

"We must think positively about this and examine all the options. While some management functions must be turned over to farmers, others will continue. The main canals of large systems need more intensive management. Future farmer-managed irrigation will need technical guidance and periodic support services.

"In fact, new needs are emerging. These include organizing and sustaining water users' associations, inter-sector river basin management and environmental monitoring and regulation. We must not see management turnover as "reduction" so much as "reorientation." Some staff may be released, perhaps some can be transferred to the water users' associations, and some may be trained and redeployed for new roles. Irrigation will always be a vital part of the economy."

At the dinner table of a house in the city, the mother spoke of an article in the day's newspaper about something called "privatization" in agriculture. She wondered if it would mean higher or lower food prices. Perhaps there would soon be a greater variety of vegetables in the market to choose from.

What do these people have in common? They are all stakeholders with a personal interest in irrigation management turnover. They will all be affected by it but they are not sure how. They *do* know it is coming. They see it as part of a broader pattern occurring all around them. The roles of the state in the economy are diminishing and the roles of the private sector — individuals, community groups, private voluntary associations, businesses — are multiplying.

What is "turnover?"

The word "turnover" is used in many countries, from Indonesia to the Dominican Republic. We define it to mean, "the transfer of responsibility *and* authority for irrigation management from the government to non-governmental entities." It may or may not include transfer of ownership of irrigation system assets (which is the more precise meaning of "privatization").

There are many other terms used locally as well. In the U.S.A., where irrigation management turnover has been a policy for decades, it is often referred to as management "transfer" (as it is also in Mexico). In Peru, it is called "transition." In Senegal, it is "disengagement." In Sri Lanka, it is "participatory management." In Bangladesh, it is "privatization." In Nigeria, it is "commercialization." In Nepal, it is "joint management." In Australia and Niger, it is "self-management." In Indonesia, it is also called "handing over." In Colombia, it is also called "takeover" (emphasizing the farmers' perspective). In China, the gradual shift towards farmer-based canal committees and O & M contracts for "specialized teams" is related to the more general agricultural reforms involving "responsibility contract systems."

Some turnover programs focus on transferring management to farmers for small-scale irrigation systems, such as in Indonesia, Nepal, Senegal (for river water lift systems) and Bangladesh (for groundwater tubewells). Just as common are turnover programs to transfer management for distributary levels of large-scale systems, such as in India, Nepal, the Philippines, China, and Sri Lanka. Countries like Mexico, Colombia and Madagascar have launched national programs to turn over management to water users' associations and gradually federate farmer associations from field to distributary, and eventually, to main system levels.

It is easier for some countries to transfer responsibility for system maintenance than transfer authority over crop plans and water distribution. Transfer of authority may involve

some loss of control by the agencies. It may require new openness about accounts, joint decision making, and mutual accountability for targets and expenditures.

In the late 1980s, Colombia declared a national policy of irrigation management turnover. The provinces set up national standard accounting procedures which determined unit costs for all aspects of O & M. This enabled irrigation managers, for the first time, to develop system-level budgets based on actual costs of management. This information was made available to the farmers' associations, that were paying irrigation fees. This "needs-based" budgeting served to reveal to farmers the actual cost of agency management. In a number of systems, farmers calculated what it would cost for them to take over the management and they decided they could do it more cost-effectively than the government. So they requested "takeover," which matched the government's policy to "turnover." In addition to these incentives, the government placed considerable emphasis on training farmers' association leaders.

Some countries, such as Senegal, Sudan and Nigeria, are not only shifting authority for O & M to farmers' associations but are also transferring the functions of providing agricultural inputs and marketing services. In countries as different as Australia and India, responsibility for developing capital replacement funds has been, or is being, devolved to farmers' associations. In Chile, ownership of irrigation system assets has been privatized into the hands of farmers' associations. Indonesia is currently reviewing this option.

Why do it?

Reasons given for embarking on irrigation management turnover are many. From economists we hear about "cost recovery," "cost-efficiency," and "cost-effectiveness." From planners we hear about "reallocation of resources" and "financial and environmental sustainability." From practitioners or specialists we hear about "management performance," "water use efficiency," and "productivity." From farmers we may hear about the need for "local control," "lower water charges" and "greater profit potential."

There is a common string of logic which underlies most of the rhetoric surrounding turnover. The common argument is as follows:

Government bureaucracies tend to lack the incentives and responsiveness to optimize management performance. Farmers have a direct interest in sustaining the cost-efficiency, profitability, and physical condition of irrigation systems. Where farmers are not already paying for the full cost of irrigation O & M (which is the typical situation in many developing countries), turnover may increase the total cost which farmers have to pay for irrigated agricultural production.

However, improved cost-efficiency and management responsiveness will generate more than enough increased income to make up for the difference. Turnover will also save money for the government. The funds can then be reallocated to other functions which can not be handled or financed by the private sector.

Of course there are potential weaknesses in this logic. Common individual interests do not always aggregate to collective action, especially where considerable socio-economic inequality exists. In some places, poorer farmers may not be able to afford additional costs for irrigation, especially where the price of cereal crops is already low. (A retort to this, however, is that greater management responsiveness will facilitate crop diversification.) In some economies, (even ones as different as Malaysia and Bihar, India) irrigated agriculture may be relatively unprofitable. Also, effective turnover demands strong local institutions, including clearly established water rights and conflict resolution arrangements. Where these do not exist, turnover may not induce the performance improvements anticipated.

And finally, the "string of logic" has little to say about equity. The emphasis is on sustainable productivity. How will management turnover affect the access to water and income of the poor, the less influential, or tail-end farmers? In some locations, local elites may capture even more control as a result

Sri Lanka — Men and women improve canals.

India — Will successful turnover depend on higher profitability of irrigated agriculture?

of turnover. (A retort to this, however, is that elites manipulate management as much or more before turnover and that turnover may actually make them more dependent on the less powerful. This is because they will need to share the costs of privatized irrigation with the less powerful. They will no longer be able to benefit from government-subsidized management.)

Management Challenges

Three things are clear from the debate. First, it *is* a debate (the issues are still largely unresolved). Secondly, turnover is happening in many places, with or without much debate — largely because of severe financial pressures. Thirdly, it is rather surprising how widespread turnover is despite the fact that the actual results of turnover, and the various approaches being used, are as yet largely unexamined internationally. This is a potentially serious problem in that management turnover could shape the nature of irrigation management and its performance over the next few decades more than any other management innovation. Perhaps more for financial than for ideological reasons, policymakers sometimes rush ahead of prerequisite legal or institutional evolution. Policies are declared and sweeping programs are implemented, often without the benefit of strategic planning, experiments, and knowledge about approaches and results obtained elsewhere. Information is urgently needed about turnover methods and results in different countries.

Turnover may involve a host of complex issues, such as dramatic changes in the roles of the irrigation agency; changes in human resources tasks, skills and deployment; new autonomous institutions in complex social settings (often requiring hydrologic, rather than administrative, boundaries); a shift from direct, hierarchical implementation to indirect, service-providing; and a shift from a construction focus to technical guidance, regulation and institutional development.

Such changes would be a daunting challenge even for the most sophisticated experts in strategic management. Management of comparably complex changes in large corporations often involves such modern strategic planning methods as environmental scanning, corporate reappraisal of organizational objectives, scenario analysis, responsibility matrices, resources needs assessments, and new information systems (Hanna, 1985). And yet most irrigation bureaucracies charged with formulating management turnover programs are administered by construction engineers, who often have little training in strategic management or institutional development.

There are pressures to treat turnover more as rapid adjustment than progressive institutional evolution. If it is to lead to sustainable and positive results, turnover will require more than policy enactments or "adjustments." It is a change which in most settings requires an evolution towards liberalizing the fundamental institutional environment of irrigated agriculture. Where this has not yet transpired, perhaps turnover policies should be more gradual and more focused on developing viable local institutions.

We hypothesize that if such far-reaching changes are not planned "strategically" (i.e., in a participatory, experimental, and analytical way) nor implemented progressively (as a gradual learning process), they are not likely to lead to a positive and sustainable result.

The following short case descriptions of management turnover illustrate the nature of the challenge in three very different settings.

BIHAR, INDIA: Turnover in Paliganj Distributary, Sone Command

On July 17, 1988 an old man approached visitors getting out of a jeep which stopped beside a structure along the Paliganj Distributary Canal. "Who are you?" he called out. "Why do you come here when you can't even deliver water to our fields?" Others came forward and joined in verbal assaults and threats. It was obvious that the level of discontent

among farmers about irrigation was near boiling point. A man from the jeep explained that he wasn't from the Water Resources Department. They were part of an Action Research Team from the Water and Land Management Institute in Patna. (Srivastava and Sinha 1991) They wanted to study the problem of irrigation in Paliganj and try to help improve the situation. He said he could not guarantee any improvement would happen, but said, "perhaps if we are sincere and cooperate with each other we can make an improvement."

The Paliganj Distributary has a command area of about 12,000 hectares (ha) in 76 villages, which affects a population of about 100,000 people. It is part of the Sone Canal System which was built in 1874 and has a command area of 700,000 ha. In 1989, fifty percent of the farm families in the Paliganj area earned less than Rs. 10,000 per year (approximately US $ 526). About 30 percent of the population is landless, most of whom work as farm laborers, leaseholders or sharecroppers. Social tensions related to caste and land tenure are pronounced. This is considered a "socially disturbed area."

Partly because of the threatening situation, field operations staff of the Water Resources Department had, for some time, ceased to venture into the command area or go down the canal. Even jeeps of armed forces accompanying irrigation officers had been attacked by angry farmers. So they restricted their movements to only operating the head regulator according to a fixed rotational schedule. Upper-end farmers commonly breached the canal and blocked it with stop logs.

Agriculture is considered unproductive by many of the small-holder farmers, in an economy with few better options. It may be one of the most difficult environments imaginable to attempt to turn over irrigation management to the farmers, much less at the level of a distributary canal with a command area of 12,000 ha. It was an unlikely location for a pilot experiment if the selection criterion was to maximize chances for success.

The Action Research Team spent the first six months making measurements along the canal and waited for farmers to approach them. Eventually, farmers began asking what they were doing and the dialogue began. Over the next several months, a series of meetings were held in villages along the command area. Farmers voiced their complaints to the team and discussed possible options for change. Research and farmers' comments indicated that the main management constraint was not below but above the outlets, along the canal.

On March 17, 1989, a landmark meeting was held with farmer representatives and the Team. Farmers said that the canal was the government's responsibility, so why should management be shifted to them? A Team member frankly replied that the irrigation officials did not feel safe to come to the canal and that upper-end farmers were blocking and breaching it. He said to the farmers, "You must bear the harm or the benefit of the system, not the Water Resources Department." The Team suggested that they form a distributary canal committee and first focus on water distribution along the canal.

After this was done, the distributary committee began a process of organizing village-level irrigation committees, focusing first on the 20 villages transversed by the canal and which were most affected by water distribution. The village committees each had five to nine members (in principle representing different tenure and caste groups). One from each village committee was on the Paliganj Distributary Farmers' Committee, which had 35 members. It met every two weeks and was a new communications link between the villages. The Team originally called the meetings. Council officers were not selected for 15 months, in order to avoid early conflict and develop trust and awareness between members. The meetings focused mostly on water distribution and agricultural activities around the canal command.

During an especially dry Kharif season in 1989 (June through November), lower-end farmers announced that because of drought they would soon have to cut the crop and feed it to the animals. When upper-end farmers realized the severity of conditions in the lower reaches (some making visits to the lower end for the first time), they arranged to close breaches and remove stop logs and set up a rotational arrangement along the canal. This set a precedent which continued, with the village-level committees acting as a conduit of information about crop conditions, crop plans, water shortages, and tampering with the canal. By now, irrigation officials were attending meetings and again interacting with farmers in the field.

In the Kharif season in 1990, an operational plan was discussed and approved by the distributary committee. Twenty farmer representatives monitored operations along the canal which became input to make modifications in the plan. During 1990, the distributary committee met 12 times. A walk-through of approximately 25 miles (40 kilometers) of the canal (which took five days) was done to identify needs for repairs. A maintenance plan was made based on priorities agreed in the committee. Irrigation officers participated in helping develop both plans. As a result, during Kharif, water reached 16 miles along the distributary canal (whereas in the past it had reached 10 miles at most). Figure 1 shows the difference in average monthly discharges reaching a lower-end measuring gauge for 1988 and 1990. In 1988 (before the action research), an average of approximately *16.7* percent of the total water entering the distributary reached gauge ten (approximately two-thirds down the canal) between July and October. During the same season in 1990, a monthly average of *21.2* percent of

the total canal water reached gauge ten.

In a recent meeting with some members of the distributary committee in July 1992, they proposed a plan to collect an irrigation fee from all members. The committee would keep 70 percent of the collection and give 30 percent to the Water Resources Department. They proposed that even collection of only one rupee per month per farmer would be sufficient to cover the costs of O & M for the canal (roughly 43 US cents). The farmers also wanted stronger legal registration and additional support from the government. Farmers have already started advising other farmers from neighboring canals about the advantages of taking over management.

This experiment, admirably attempted in a challenging environment, is in need of a larger strategic framework. Rather than occurring as part of an overall state policy and strategic plan, this action experiment arose as a locally induced initiative. To sustain it and encourage dissemination, a more systematic policy and comprehensive program will be needed at the state level.

INDONESIA: Small-Scale Irrigation Turnover Program

With the collapse of the oil boom in the mid 1980s, revenues of the Government of Indonesia shrunk enough to require a 50 percent reduction in the budgets of both the agriculture and irrigation departments. Numerous structural adjustment policies (SAPs) were adopted. The three main SAPs in the irrigation sector were the introduction of an irrigation service fee, needs-based O & M budgeting and small-scale irrigation management turnover. Pressures from the government and donors forced a rapid response from the Irrigation Department to develop and implement a nation-wide program to transfer management for all small-scale irrigation systems in the public inventory from the provincial irrigation services to water users' associations. The first wave of turnovers would be for systems below 150 ha in command area. The second wave would be for systems between 150 and 500 ha in size.

Indonesia — System repair precedes management turnover.

Since Indonesia has a large number of small-scale irrigation systems, all public systems below 500 ha in size constitute 70 percent of all public systems or 21 percent of the total design area for public irrigation in the country. Early in 1987, a national-level working group was formed, consisting of officers from the Directorate of Irrigation I, the Ford Foundation, a national NGO (LP3ES), and IIMI (IIMI 1989). Given a short time frame of less than a year, the working group was charged with the task of developing a viable process and work plan for implementing turnover throughout the country. Various rapid appraisals, workshops, brainstorming and planning exercises, and other consultative activities were held as the group moved towards identifying a process.

By early 1988, the turnover program had started in two provinces, in West Java and West Sumatra. By 1990, turnover had spread to seven provinces. The overall objective was to save funds for O & M from the small-scale systems to enable the

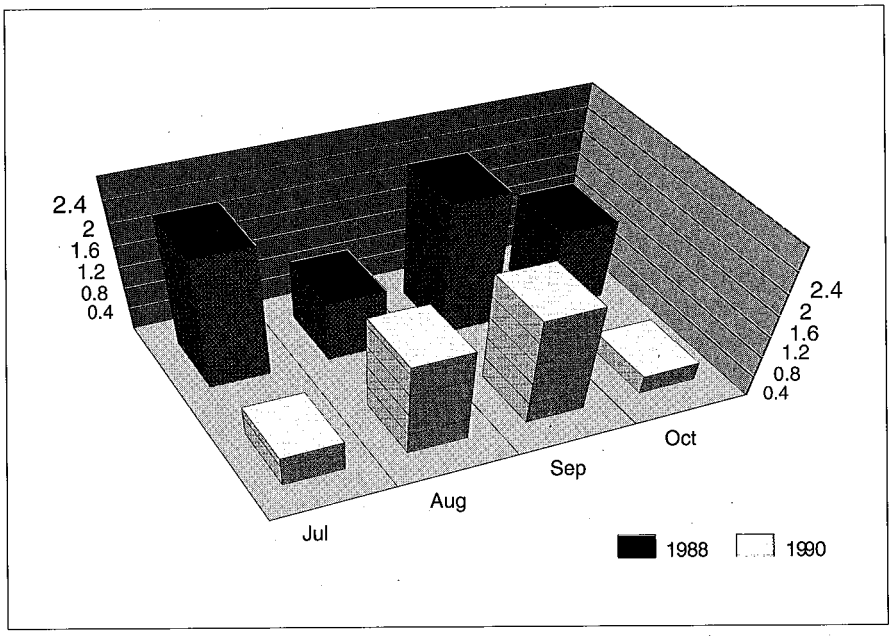


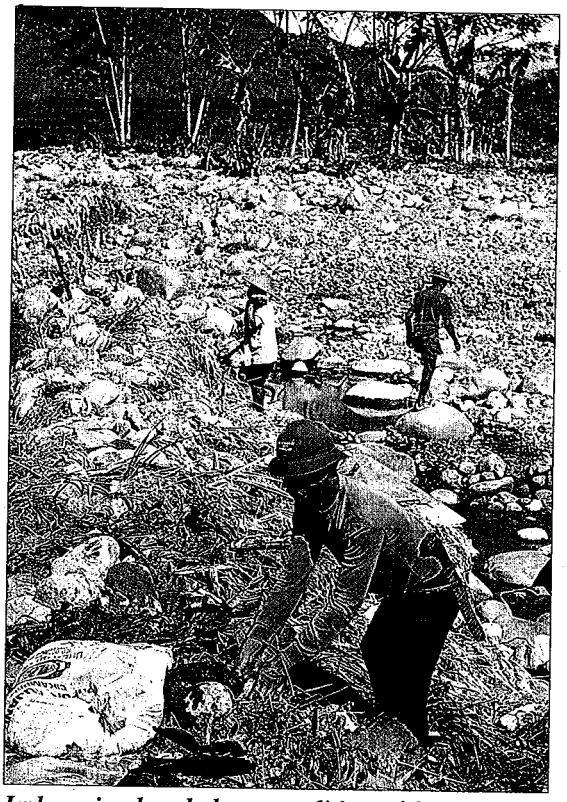
Figure 1. — Water reaching lower section of Paliganj Distributory Canal, Bihar, India, during Kharif season, 1988 and 1990.

funds to be reallocated to large systems.

The turnover process involves six basic stages of implementation. First is a provincial-level survey of basic information on all eligible systems, based on existing records. This supports planning for implementation, training needs and budgets. Second, field inventories involving system walk-throughs and interviews yield information on existing management roles and on whether or not physical repairs are needed prior to turnover. Third, a detailed profile of each system is done by a trained irrigation officer, together with farmers, to plan institutional and physical system improvements needed before turnover. Fourth, needed system repairs are identified, prioritized and designed by farmers, with assistance from the irrigation service. Construction labor is performed by local farmers where possible. Simpler, low-management-intensity designs are frequently suggested and partly designed by farmers. Fifth, water users' associations are organized, training in O & M is given to farmer representatives, and O & M work plans prepared. The sixth step is official system turnover, which is expected to occur between 12 and 18 months after initial activities begin in the system.

In Indonesia, turnover is occurring in many small systems where the farmers are already doing much, if not all, of the management. Turnover often constitutes an official acknowledgement of what is already the reality. In other cases, new roles for gate operations and canal management are newly transferred to the users. Since the government could not afford to hire enough externally recruited institutional organizers for a national program, it opted to train existing field operations staff and assign them as organizers. The government provides an average of about US $100 per hectare for system repairs prior to turnover. No local investment was required, except for participation in planning and training.

IIMI assisted the government in participation in national and provincial-level working groups, in process documentation research, and in economic analysis. It has been estimated that over the 15 years projected for implementation, turnover could save the government about Rp. 22.5 billion (in 1987 rupiah's or ± US$13.5 million) in O & M costs for small-scale irrigation. A key objective is to reallocate this money to larger systems above 500 ha in size, in order to achieve the planned allocation of Rp. 25,000 (± US $15) per hectare per year for O & M budgets for larger systems. This is an average amount estimated as needed to make them sustainable. Figure 2 shows the potential budgetary effects of turnover in one section of the West Java Provincial Irrigation Service in Sumedang, West Java. In two stages, all of the funds previously spent on systems below 500 ha are transferred to systems 500 ha and above in size. Because of the large number of small systems and the small number of large systems in the Sumedang Section, reallocation of funds due to turnover will enable it to meet the Rp. 25,000 per hectare per year requirement for the large systems and have a residual left over (IIMI 1989).



Indonesia already has a tradition of farmer investment in irrigation.

Preliminary research during the early stages of implementation indicated that turnover was not having a general negative impact on performance of the systems and that considerable voluntary investments and labor activities were stimulated by the turnover process. However, considerable attention to construction overshadowed the need for more attention to institutional development and O & M training for water users' organizations. Further clarification is probably needed about the disposition of agency staff in systems after turnover and about whether ownership of system facilities will also be transferred to farmers' organizations. As the program spreads rapidly, greater emphasis is needed on developing an effective information system and well-supervised management training.

Pressures for keeping ambitious construction, system turnover, and dissemination targets must be balanced with the overall strategic principles of the program — which are to follow participatory, physical and institutional improvement methods aimed at engendering a sense of ownership and responsibility among farmers.

Management Turnover in the Columbia Basin Project, USA

The US Bureau of Reclamation (USBR) is not without some similarity to water resources ministries in

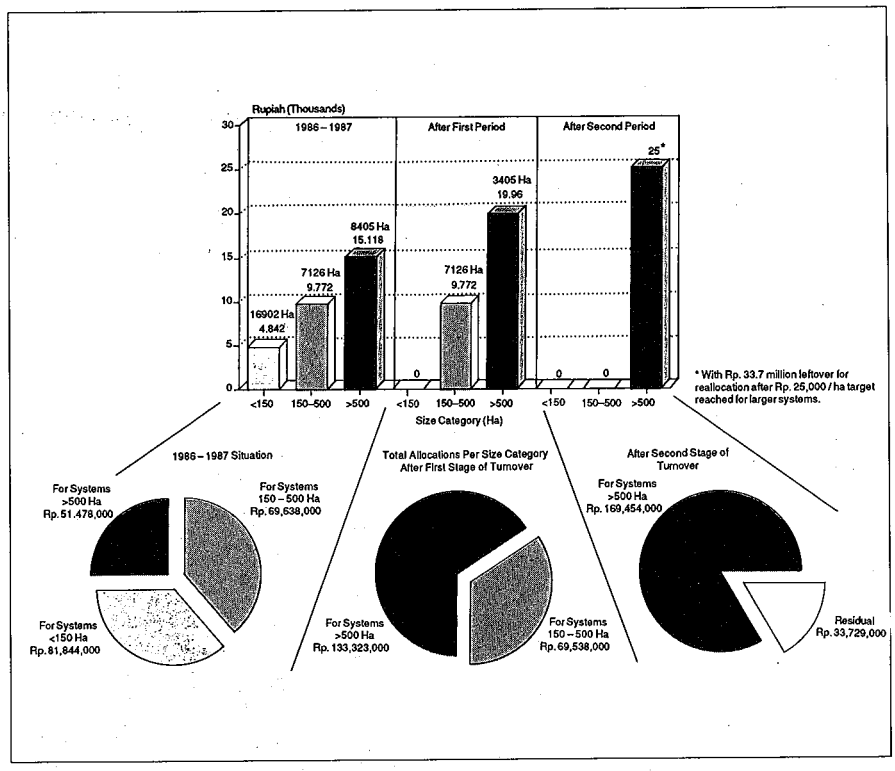


Figure 2. — Potential budgetary effects of management turnover in Sumedang Section, Indonesia (before and after turnover).

developing countries. It emerged out of a policy to expand irrigated area for the social welfare objectives of resettlement. The Bureau has heavily subsidized the true cost of irrigation water to farmers. It has been primarily a construction agency, with less emphasis on handling operations and maintenance. However, the Bureau differs from most counterparts in developing countries by its original mandate to transfer management for even large-scale irrigation systems to users' irrigation districts as soon as possible following construction. It also helps create water users' districts, negotiates construction repayment schedules for the farmers and seasonally charges users for the cost of water prior to delivery.

The Columbia Basin Project is a 557,528-acre irrigation system (225,626 ha) located in Washington State, USA. It extracts about 2.6 million acre-feet of water annually from the 500-foot high Grand Coulee Dam on the Columbia River. By 1986, US 1.687 billion dollars had been spent on construction of the dam, irrigation facilities, and the 6.5 thousand-megawatt hydroelectric power plant complex. The USBR negotiated construction repayment contracts with the irrigators prior to the first flow of water through the canals in the early 1950s. Irrigation fees pay for annual O & M costs, a capital replacement fund (equivalent to 30 percent of annual O & M costs), and 12 percent of the total construction cost (which is US $1.06 per ha, to be repaid without interest over 50 years).

The Project has 2,026 miles of main, branch, and lateral canals and 7,000 turnouts, plus several thousand miles of surface and subsurface drains. Water application is mostly done by sprinklers. A large variety of crops are grown, including grains, vegetables, fruit, and hay. Agriculture has been relatively profitable over time, with gross value of output rising in real terms from US$356 in 1960 to $828 in 1989 (in 1982 prices).

After irrigation began in 1953, the irrigation component of the Project was managed by the USBR. The Bureau was interested in management turnover because of its long-standing policy (dating back to 1902) and its lack of interest in dealing with thousands of farmers for O & M. The districts were interested in taking over management in order to gain local control over operations and policy and to ensure that management was cost-efficient (so that irrigation fees remained as low as possible).

In 1969, management for the main system and downwards was transferred to three irrigation districts (which are water users' associations). Several years of negotiating management and cost responsibilities between the districts and the Bureau preceded turnover. In contrast to the emphases on construction, farmer training and institutional development — which are typical of turnover programs in developing countries — management turnover in the Columbia Basin Project was characterized by extensive negotiations (involving lawyers on both sides), hydrologic and economic studies, and legal analysis. Key questions needing negotiated agreements included the cost and equity considerations of various transfer options, district realignments of responsibilities and boundaries, setting of maintenance standards and disposition of Bureau staff displaced by management transfer.

Staff displacement was the final obstacle to agreement. Two hundred and ten Bureau staff positions were abolished at the time of turnover, which occurred in 1969. More than 80 percent of these staff were transferred to the districts; others were transferred elsewhere in the Bureau or retired. Total Bureau Project staff declined from 841 in 1968 to 247 in 1970. The Power Division was transferred to an independent office in 1970. Bureau staff in the Project continued to decline after turnover, dropping to 83 in 1985 (Figure 3). In 1991, there were only seven O & M positions for the Project remaining in the Bureau. O & M was in the Irrigation and Land Division.

The districts were able to absorb many of the displaced staff partly due to their revenue-raising capability. The districts obtain revenue from irrigation fees (with a virtual 100 percent collection rate), excess water charges to members, water selling "service contracts" to non-members, and sale of hydro-electric power. Figure 4 shows the revenue composition compared to total expenditures of the Quincy District after turnover.

Each district has between 2,000 and 2,500 water users and elects a board of directors to oversee policy and guide district managers. Water is distributed on a "modified demand system," based on daily farmer requests subject to the constraints of supply, scheduling, and individual entitlements or willingness to pay excess water charges. Water delivery to farmers' fields are cut off for nonpayment of fees. Land titles are appropriated from farmers by the districts if the farmers fail to pay irrigation fees. Since turnover, the Quincy District alone has foreclosed and resold more than 20 landholdings due to nonpayment of water charges.

The Bureau was able to absorb much of the shock of turnover partly through its own reorientation. By 1970, the Bureau was severely cutting back on new construction activities and gradually working its way into new functions, including land management, regulation of wildlife and recreation and wetlands and environmental monitoring and regulation. Some staff displaced by turnover were trained and shifted to other activities.

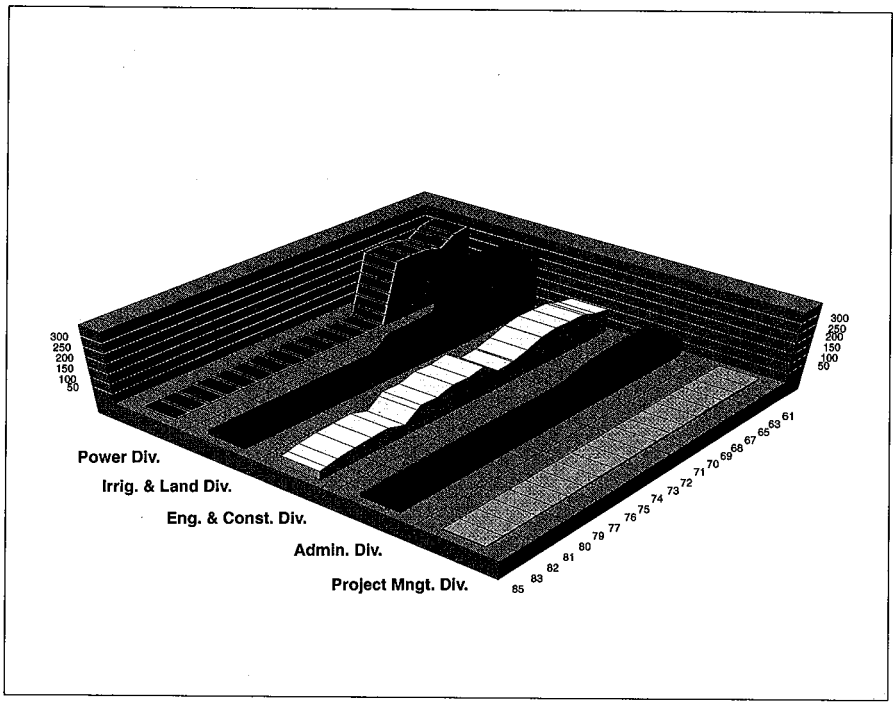


Figure 3. — Number of US Bureau of Reclamation Staff, by division, in the Columbia Basin Project, 1961 – 1985.

Data on the project suggest that management turnover has not brought about any significant drops in water use efficiency, agricultural productivity, profitability of agriculture, economic viability of the districts, or the basic physical sustainability of the system. The Bureau was able to divest itself of an unwanted burden and the farmers gained local control over a primary resource.

Some of the important factors in the success of turnover in the Columbia Basin Project were the strong legal institutions; the clear system of water rights; strategic processes of negotiation, research and legal analysis; rising profitability of agriculture; and multiple sources of revenues for the districts.

The three examples described above show the complexity of issues surrounding irrigation management turnover. It is not a kind of change which can be accomplished through rapid, high-level structural adjustment. It involves an evolution of multi-level

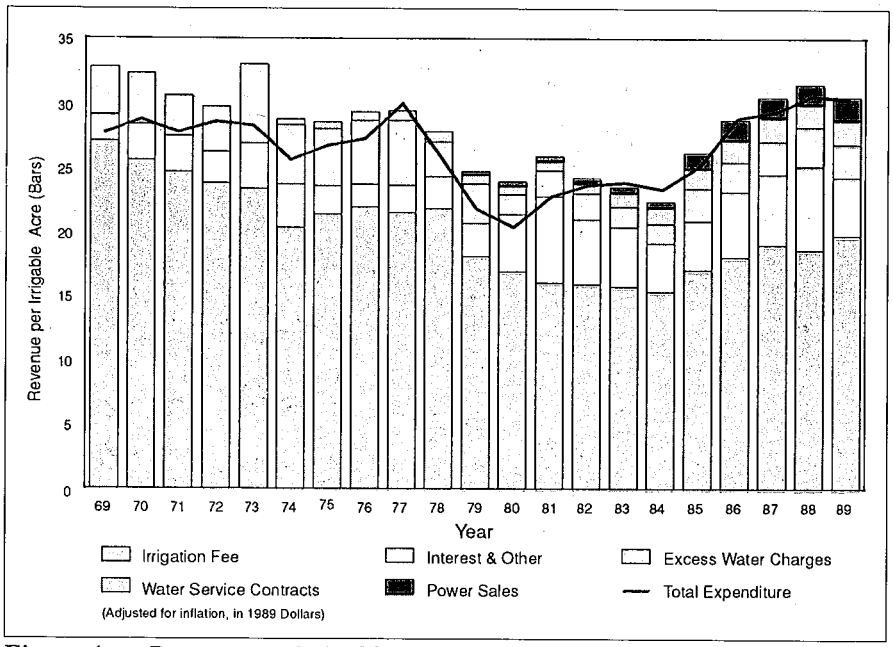


Figure 4. — Revenue per irrigable acre, Quincy Irrigation District, Columbia Basin Project, 1969 – 1989.

changes in financing, management, institutions, attitudes, and often technologies.

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