

Privatization and Self Management of Irrigation in Developing Countries

Annual Progress Report for 1994



Submitted to the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

by the

**Local Management Program
International Irrigation Management Institute
Colombo, Sri Lanka**

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Project Name: Privatization and Self Management of Irrigation
Submitted to: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)
GmbH
GTZ Office: International Agricultural Research
Project No. : 91.7860.9-01.288
Contract No.: 4-7032-60115548
BMZ letter: May 14, 1992
Project Period: 1 June 1992 to May 31, 1995
Submitted by: Local Management Program, International Irrigation Management
Institute

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1. OVERVIEW OF THE PRIVATIZATION AND SELF MANAGEMENT PROGRAM

1.1 Background

This is an Annual Progress Report for 1994 for the Project, "Privatization and Self Management of Irrigation." It is submitted by the Local Management Program of the International Irrigation Management Institute, or IIMI, to the German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit) or GTZ. In May 1992, the German Federal Ministry for Economic Cooperation (Bundesministerium für wirtschaftliche Zusammenarbeit) or BMZ, agreed to finance the Project, "Privatization and Self Management of Irrigation" (or PSM Project). The contract agreement for this Project is between the GTZ and IIMI. IIMI communicates and cooperates with the GTZ on all technical and administrative aspects of this Project. The Project is implemented through the program staff at IIMI which are or will be attached to the Local Management Program, other IIMI staff which are involved in this Project and through other institutions or consultants with whom IIMI collaborates on the Project. This Report was prepared by Dr. Douglas L. Vermillion of the Local Management Program with written inputs from S. Johnson, J. Brewer, M. Samad, C. Garces-Restrepo, Mark Svendsen and Wim Kloezen.

1.2 Objectives and Activities

The objectives and activities for Phase I of the Privatization and Self Management Program are summarized as follows.

- 1) Document the relationship between turnover arrangements, the privatization process and performance impacts through five case studies on management turnover approaches, management and policy environments and results in selected countries.

In collaboration with national research or irrigation agencies, IIMI has conducted case studies of irrigation privatization or turnover in the USA, China, Colombia, Sudan and Sri Lanka. Each case represents a different kind of policy, organizational, agricultural and technical environment within which the role of government in irrigated agriculture has declined and the role of farmers and/or other non-governmental entities has increased in recent years. The case studies examine the nature of the turnover arrangements and processes, how these effect financing and management practices and what impacts turnover may has on agricultural productivity and profitability, water distribution and use and the physical sustainability of irrigation structures.

The case study in the Colombia Basin, USA examines the results of a 1969 management turnover to farmer districts in a context of established water rights, volumetric water charging, strong legal recognition of farmer organizations and a clear policy of bureaucratic reorientation of the government out of irrigation management.

The case study in Colombia examines the nature and results of a 1976 management turnover in two irrigation districts where water rights and legal status of the farmers' organizations were somewhat unclear and the irrigation agency kept partial control over district budgets, staffing and O&M plans after turnover.

The case study in China examines the changes and impacts of production responsibility system reforms in two irrigation districts in north China since the early 1980's in a context of negotiable water rights, area and volumetric water charging, strong incentive and accountability systems and legally recognized village irrigation organizations.

The case study in Sri Lanka analyzes the formation of federated farmer organizations and their take over of operations and maintenance at tertiary, distributory and, in one site, system levels in medium and large scale systems which are jointly managed by government agencies and farmer organizations. Particular attention is given to management roles, farmer perceptions and financial viability of irrigation management turnover in a context of joint management.

The case study in Sudan compares management practices and performance of three management models for river surface lift irrigation systems along the middle section of the White Nile at a time when the government was privatizing their management. The three models are the White Nile Agricultural Corporation, farmers' organizations and a private holding company contract management.

- 2) Identify key patterns, issues and hypotheses about irrigation privatization and turnover at the international level through a comparative analysis of data and literature about turnover policies and arrangements, change processes and results.

Through analysis of data from the five case studies, information from the series of Short Reports on Locally Managed Irrigation, review of literature and information obtained through workshops and networking, IIMI has identified key problems and issues and specific hypotheses about turnover. Originally it was expected that more firm conclusions and hypothesis confirmation could be done during Phase I of the PSM Program but research and information review revealed that a considerable variation in approach to turnover, farmer responses and outcomes exists between countries. Also, it became apparent during the Study that significant gaps often exist between official turnover policies and actual implementation in the field, often due to resistant agency staff at operational levels. Hence a systematic comparison to confirm hypotheses about management turnover would require comparison of actual turnover arrangements at the system level for a large number of systems. And it became apparent that more work was needed in first identifying key issues and more specific hypotheses about privatization and turnover from the complex variability of turnover approaches before a more tightly-controlled systematic comparative study could be conducted effectively.

During the Study to date IIMI also conducted a reconnaissance survey by mail to obtain basic information on turnover policies and programs. The survey was sent to key irrigation sector experts or officials in more than 20 countries in Asia, Africa and Latin America. Only six completed survey forms were returned. In its proposal for a Phase II of the PSM Program, IIMI states its intention to simplify the form and target them to people more closely connected to IIMI or the ICID and to complete the information for several countries through IIMI staff or direct visits. This will be important in providing a global perspective on where which kinds of turnover policies and programs are being planned or implemented.

- 3) Facilitate exchange of information between countries through country level seminars and workshops, presentations at international workshops and conferences and publications in existing newsletters and IIMI and non-IIMI outlets.

Through the series of case studies, short reports solicited from experts, workshops, literature review and information networking, IIMI has developed a center of information on irrigation management turnover and privatization and has disseminated the information through its publications, journal articles, national and international meetings and the International Conference on Irrigation Management Transfer, held in Wuhan, China in September 1994.

- 4) Facilitate strategic change for irrigation management turnover through preparation of general guides for policy, program formulation and training and development of methodologies for pilot turnover experiments possibly in two countries.

It was decided to postpone preparation of the guide books until more systematic comparative assessment was done, partly due to comments of Phase I Advisory Committee members and others that IIMI should not promote turnover uncritically and should obtain more systematic evidence before recommending turnover practices. IIMI is currently in the process of planning possible action research activities related to management turnover in Sudan, India and/or China.

1.3 Staff Assignments and Collaborating Institutions

Dr. Douglas L. Vermillion, rural sociologist and irrigation specialist and Dr. Sam H. Johnson III, agricultural economist and senior irrigation specialist, were joint project leaders for the Privatization and Self Management of Irrigation Program during 1994 and were based at IIMI headquarters in Colombo, Sri Lanka.

Dr. Vermillion and Mark Svendsen, an agricultural engineer based at IFPRI in Washington, DC during the first half of 1994 (and after June 1994 as a private consultant), were principal investigators for the case study on irrigation management transfer in the Columbia Basin, USA. This study was done with the assistance of Mr. Bernd Maier, a German graduate student at Washington State University, USA.

For the case study on irrigation management turnover in Colombia, Drs. Vermillion and Carlos Garces-Restrepo, irrigation engineer, were principal investigators. Mr. Juan Fernandez, agricultural engineer and consultant, assisted with the field research. IIMI collaborated with the Colombian Institute for Hydrology, Meteorology and Land Development (HIMAT) in this study.

Dr. Vermillion and Johnson were principal investigators for the case study on irrigation management reform and devolution in north China. Dr. Mark Svendsen assisted with the study as a part-time consultant with IIMI on the China Case Study. This study was done in collaboration with the Shijiazhuang Institute of Agricultural Modernization, Chinese Academy of Sciences, under the leadership of Professor Liu Changming.

For the case study on irrigation management turnover in Sri Lanka, Dr. Jeffrey Brewer, rural sociologist and irrigation specialist, and Wim Kloezen, agricultural engineer and associate expert, were principal investigators. IIMI collaborated with the Irrigation Management Division, Ministry of Lands, Irrigation and Mahaweli Development, Government of Sri Lanka. Dr. Brewer and Mr. Kloezen are resident in Sri Lanka.

For the case study on the privatization of pump irrigation systems on the White Nile, Sudan, Dr. M. Samad, agricultural economist, was principal investigator. Dr. M. Shafique, IIMI irrigation engineer, and Dr. Dingle, agricultural economist worked part-time on the case study in Sudan. Dr. Samad was based at IIMI headquarters and made several trips to Sudan. Drs. Shafique and Dingle were based in Khartoum.

2. SUMMARY OF RESEARCH ISSUES AND FINDINGS

The following is a brief summary of key tentative findings and hypotheses which have emerged from Phase I of the PSM Program. They are relatively tentative because they have emerged from five case studies. During Phase II they will be tested systematically for their generalizability in the proposed comparative survey. The findings are grouped in terms of: 1) key supporting or inhibiting conditions in the management turnover context which effect the success or failure of turnover programs, 2) characteristics of the management transfer process and 3) post-turnover arrangements which should be in place to ensure sustainable local management.

2.1 Pre-conditions for Viable Irrigation Management Turnover

Comparative results from IIMI's case studies and other reports on turnover programs indicate that a clear water right at the system and user levels, with a compatible water distribution arrangement, exist in each of the cases of more successful turnover in the Phase I study (Svendson and Vermillion, 1994a; Vermillion, Wang, et al., 1994; Vermillion and Garces-Restrepo, 1994). Where these do not exist it may be difficult to form farmer groups to manage irrigation collectively. (Kloezen, 1994; Woodhouse and Ndiaye, 1990; Vermillion, 1994b). Where farmer organizations lack full legal and political recognition to make all decisions necessary to manage the irrigation system they appear to have difficulty achieving cost efficiency, raising adequate revenue, applying sanctions and entering into contractual relationships with third parties (Garces-Restrepo and Vermillion, 1994).

Comparative research on farmer managed irrigation suggests that farmers are only willing to invest in maintenance or system management when benefits obtained (in water deliveries or agricultural production) are generally proportionately related to farmer investments in the system (Ostrom, 1992). In other words, the benefits of self management (such as cost efficiency, responsive and reliable service, productivity and sustainability) will outweigh additional costs (in time or expense). The value of water and farmer investments in irrigation exceeds the opportunity costs (Ostrom, 1994). Farmers must have a clear basis for assuming that management turnover will enhance the profitability of irrigated agriculture for them. Factional divisions or extreme socio-economic differences can prevent emergence of effective collective action for management takeover (Wade, 1988). Investment by farmers in construction or in operations and maintenance, either through labor, payment of a fee or other means encourages a sense of ownership and serious concern about the performance and sustainability of the irrigation system among farmers (Lam, 1994). Skills required to manage irrigation systems turned over to farmers must be made available among farmers or be recruitable by farmers.

An important issue still to be resolved is what is the maximum or optimal size limit for farmer organizations which are taking responsibility for irrigation management. Related to this is the question of federation of farmer organizations and whether medium or large scale irrigation systems should be managed by multi-tier farmer organizations or by joint agency/farmer management (Merrey, 1994; Ostrom, 1992). There are some indications that irrigation district or company management models may be better suited than farmer organizations for managing more

large scale or complex irrigation systems (Svendsen and Vermillion, 1994; Maass and Anderson, 1986).

Findings from the research to date indicate that irrigation management turnover will be acceptable by farmers' organizations and result in sustainable local management only where the following arrangements are in place:

- turnover is cost-beneficial to the majority of farmers,
- social divisions are not serious enough to disrupt communication and decision-making between farmers,
- clear and sustainable water rights are vested in the managing entity,
- the turnover policy clearly designates responsibility and authority and supportive accountability and incentive mechanisms at the operational level--including clear designation of responsibility for long-term maintenance and rehabilitation,
- irrigation system infrastructure is appropriate for local management capacities, and
- adequate human, financial, information resources are available to support local management (due to profitability of irrigated agriculture, sideline revenue sources, willingness of farmers to pay water fees, etc.).

Where the above conditions are not found, we hypothesize that turnover will not lead to locally sustainable management.

In short, research to date suggests that sustainable local management after turnover or privatization requires that a set of essential conditions be put in place through policy, program arrangements or the turnover process (Vermillion, 1994b). Five conditions appear to be present in successful cases of turnover (Columbia Basin, USA and China) and are not present in less successful cases (Sri Lanka and Sudan). These are:

- 1) a clearly recognized and sustainable water right,
- 2) appropriate infrastructure relative to local management capacities,
- 3) clear designation of responsibility and authority for all essential management functions,
- 4) supportive accountability and incentive mechanisms relative to designated management responsibility and authority, and
- 5) adequate resources (financial, information, human) for sustainable irrigation management.

2.2 Management Turnover Process

Research to date has shown that strong support from high levels of the government for turnover must be directed towards the irrigation agency, otherwise bureaucratic resistance can interfere with turnover, especially at operational levels by agency staff (Srivastava and Brewer, 1994; Vermillion and Garces-Restrepo, 1994). Irrigation or water resources agencies pressured to rapidly implement structural adjustment policies such as management turnover or outright privatization of irrigation systems tend to focus on rehabilitation and organizing farmers to the exclusion of comprehensive strategic planning about the reorientation of the irrigation agency and

disposition of staff displaced by turnover. This appears to compound the problem of bureaucratic resistance (Samad and Dingle, 1994; Kloezen, 1994; Vermillion and Johnson, 1990). Pilot testing and action research are used in some countries in the early stages of turnover programs, but often more as a means for training staff to implement turnover rather than as an experimental, comparative means to develop a replicable turnover strategy (Vermillion, 1989a).

As demonstrated in the Philippines, the use of trained farmer organizers can be an efficient and effective approach which is practical to adopt on a large scale (Bautista, et al., 1994). This may be more effective and more cost efficient than attempts to organize farmers with government agency staff (Bagadion, 1994; Helmi and Vermillion, 1990). Turnover programs in as diverse settings as Indonesia and Colombia show that negotiations between the government and farmer organization representatives are needed at each stage of the transition process in order to resolve various issues of management responsibility, rehabilitation, financing, etc. (Bruns and Sudar, 1994). NGO's oriented toward dealing with organizational matters are often used to assist farmer organizations to develop their own locally-appropriate by-laws, accounting system, proposals for system infrastructure improvement and management plans (Bruns and Sudar, *ibid*; Mott MacDonald, 1993). It may be necessary at this stage to set up an accounting system which involves financial and technical audits by a neutral and authoritative external body. This is to create confidence among farmers and prevent abuses (Vermillion and Garces-Restrepo, 1994; Svendsen and Vermillion, 1994a).

System design and technology which may have been originally installed for management by agencies and technical people may need to be revised to be compatible with local management capacities and water rights (Vermillion, 1994c; Diemer and Slabbers, 1992). Government-sponsored rehabilitation prior to turnover without farmer participation or investment tends to amplify farmer dependency on the government and obstruct achievement of objectives of turnover programs (Vermillion, 1989a; Vermillion, 1989b). Where clarity is lacking about the terms and conditions for future rehabilitation and system improvements, especially regarding financing obligations, farmers are unlikely to raise a capital replacement fund (Garces-Restrepo and Vermillion, 1994a). Where there is a clear policy that farmers must finance rehabilitation it appears more likely that they will raise a capital replacement fund once they know that they are responsible for the long-term sustainability of the system (Svendsen and Vermillion, 1994a). Where organizational and management skills are lacking an emphasis on training farmers and management staff may be essential to introduce viable local management (Wijayaratna and Vermillion, 1994; Plusquellec, 1989). Where agency field operations staff are transferred to new farmer associations training may be less important (Svendsen and Vermillion, 1994b).

In summary, the irrigation turnover process supports emergence of locally sustainable irrigation only where:

- the turnover program has high-level political commitment,
- before implementation, the government clearly designates alternative roles and staff placements for the irrigation agency after turnover,

- farmer organizations should be developed before turnover and involve supportive traditional institutions and experienced farmers,
- where needed, rehabilitation should be done only if involving farmers in decision-making and investment, and
- by-laws, conflict resolution arrangements, accounting systems and O&M plans are developed during the turnover process.

Where the above elements of the turnover process are missing we hypothesize that the managing entity will be weaker and performance outcomes will be less positive after turnover.

2.3 Post-turnover Arrangements

After turnover, a qualified entity such as the irrigation agency may be needed to provide technical guidance to farmer management organizations to help protect the integrity of irrigation structures and protect against unwanted externalities such as environmental damage (Garces-Restrepo and Vermillion, 1994b). This could be organized as a periodic technical audit (Svendsen and Vermillion, 1994a). A periodic financial audit of farmer organization accounts by a qualified and neutral entity recognized by the government can help prevent abuses and provide legitimacy to the organization in the eyes of the farmers. Where the government retains a role in providing future assistance to farmer managed irrigation organizations for rehabilitation or system improvement, governments can encourage responsible irrigation management and local raising of a capital replacement fund by linking performance assessment from the technical and financial audits to conditions for receiving future government assistance (Svendsen and Vermillion, *ibid*).

The long-term sustainability of local organizations to management irrigation systems depends largely on their ability to adapt to changing external conditions and the need to become profitable enterprises. Support services will be widely needed for farmer-based irrigation management organizations to help them make the transition from narrow O&M organizations to a more integrated business-oriented production organization. Support services will likely be needed the most to enhance profitability of farming through bulk purchase of agricultural inputs, timely resolution of technical problems with irrigation system operations and maintenance, credit and financing, legal assistance, dispute resolution, provision of business-oriented information and product processing and marketing (IIIM, 1987). As competition for water increases, as management for irrigation systems is devolved to local organizations and as water-related environmental problems spread in many parts of the world, higher-level organizations are urgently needed at the level of the resource base (river basins, watersheds, aquifers) to manage, regulate and protect the sustainable productivity of water and land resources. Interest is growing in development of federated community user or common property groups to take over functions of planning, allocating and enforcing resource use at watershed or aquifer levels (Vermillion, *forthcoming*).

Interest is also growing in establishing the institutional parameters within which water markets can work effectively and fairly. Local dispute resolution arrangements are often inadequate to support locally managed irrigation. Farmer organizations at the irrigation system or federated levels are often incapable of settling water-related disputes in an expeditious, objective and

authoritative manner. Regarding financing, as government subsidies to irrigated agriculture decline, new local management organizations may often find it necessary to replace old subsidies with new forms of secondary revenue such as water sales and sideline businesses to keep irrigation systems financially viable (Vermillion, et al. 1994; Johnson, et al., 1994; Svendsen and Vermillion, 1994a). Secondary revenue generation may also create stronger incentives for farmers to support their organization.

2.4 Appropriate Local Management Models

Research and development practice in irrigation management in developing countries to date is producing a steadily growing body of evidence to support four important propositions about the prospects for irrigation reform in developing countries.

- 1) Public sector irrigation management is generally characterized by poor management performance, financial insolvency and physical deterioration. This is true for both small and large scale irrigation systems in developing countries;
- 2) There is a limit to the size and amount of federation which water users associations can do and be effective. They seem to be best suited to managing small scale irrigation systems;
- 3) There are signs that the widely promoted model of joint management of medium and large scale irrigation systems by centrally funded agencies and water users associations is unstable and ineffective;
- 4) It is apparent that new alternative models for managing medium and large scale irrigation in developing countries are urgently needed to reverse serious deterioration and inefficiencies. Two alternative models which appear to be more viable and effective than agency or joint management approaches are: 1) "irrigation districts" governed by farmer-elected boards and managed by specialized staff and 2) mutual or contract "irrigation management companies."

If the above propositions are true, IIMI sees the need for an evolutionary shift toward three basic alternative management models as governments in developing countries decrease their role in direct management of irrigation systems. If found by research to be appropriate and if given adequate strategic support, these management models may be expected to evolve, over the future approximately as follows:

- 1) direct management of small scale irrigation systems by farmer organizations,
- 2) management for medium scale or medium complexity irrigation systems by irrigation districts which are governed and supervised by farmer-elected boards and have specialized staff for management, and

- 3) management for large scale or more complex irrigation systems by irrigation companies which are either owned or contracted by a federated farmers' organization and governed (but not supervised) by a farmer-elected board.

The above tentative findings are based on in-depth analysis of turnover and privatization in a small number of case studies and an assessment of literature about turnover programs worldwide. Research to date tentatively indicates that irrigation management turnover will have more effective management and performance outcomes where the level of professionalization, specialization and accountability of the managing entity matches the level of complexity imposed by the scale and management intensity of the management environment. We hypothesize that either the level of organizational sophistication will be higher in more complex management environments or if not, the local management entity will be ineffective and management performance will be less positive.

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3. PROGRAM ACTIVITIES AND RESULTS

3.1 Case Study on Irrigation Turnover in the Columbia Basin, USA

This case study was initiated before the PSM Project began under IIMI unrestricted core funding. Later phases of data collection, analysis and preparation of the final research monograph were done after the PSM Project began in 1992 and 1993. The final text was completed by the end of 1993 and was submitted to IIMI's Information Office for publication. The study was published by IIMI in 1994 as a Research Paper and a paper was prepared for presentation at an international conference (Svendsen and Vermillion, 1994b).

Currently there is keen interest in many developing countries in transferring responsibility for operating large publicly-constructed irrigation systems to the farmer-beneficiaries of the systems. To understand the implications of such a shift on the performance of a system and the conditions under which such transfers can take place successfully, a case study was undertaken to document the causes and results of such a transfer. The Columbia Basin Project (CBP) in Washington State, USA was selected for this study. This selection was based on the facts that the United States has had a policy mandating transfer of managerial responsibility for publicly-developed irrigation to users for almost 100 years, that good quality historical records describing system hydrology and financial performance were available, and that transfer in the CBP occurred more than 20 years ago, providing ample time for the post-transfer situation to stabilize and for longer-term problems to emerge.

The following is a summary of this study.

INTRODUCTION

This paper discusses a representative case of transition to farmer management in the American west. It first discusses the national policies which govern irrigation management in the United States and institutions which implement them, and then describes the Columbia Basin Project. Then follows a summary of the results of the analysis of the impacts of the transition, organized around four topics—technology adoption, hydrologic performance, financial performance, and farm profitability. It then offers several general conclusions and goes on to identify conditions felt to have influenced and facilitated the successful transfer. Finally, it suggests important lessons for those attempting similar transfers in developing countries.

BACKGROUND

Currently there is keen interest in many developing countries in transferring responsibility for operating large publicly constructed irrigation systems to the farmer beneficiaries of the systems. To understand the implications of such a shift on the performance of a system and the conditions under which it can take place successfully, a case study was undertaken. The Columbia Basin Project (CBP) in Washington State, USA was selected for this study. This selection was based on the facts that the United States has had a policy mandating transfer of managerial responsibility for publicly developed irrigation to users for almost 100 years, that good quality historical records describing system hydrology and financial performance were available, and that transfer in the CBP occurred more than 20 years ago, providing ample time for the post-transfer situation to stabilize and for longer-term problems to emerge.

The CBP is a large multipurpose reservoir-based project located on the Columbia River in the state of Washington near the Canadian border (Map 1). Construction of the dam was begun in 1933 and water first reached the command area in 1951. The current irrigated area is about 230,000 hectares (ha), while facilities for a roughly equal area included in the original plan have never been constructed. All water used by the irrigation system must be lifted 85 meters, from which point it is distributed to the command area largely by gravity flow.

The national irrigation development agency, the US Bureau of Reclamation, constructed the project and operated it from 1951 until 1969, when management was turned over to a set of three farmer-controlled irrigation districts. These districts had been established in 1939 while construction was still underway and had signed repayment contracts with the Bureau obligating their members to reimburse the government for part of the cost of building the system. Each district today consists of 2,000 to 2,500 landowners and is controlled by a board of 5 to 7 persons elected from among them. The districts operate on a nonprofit basis and are required to cover their own operating costs. Districts purchase water from the Bureau and then resell it to their members. Payments to the Bureau include an energy charge for basic water lifting from the reservoir, but the rate applied is highly subsidized. The Bureau continues to operate some common facilities and retains formal ownership of all system facilities, though the right to operate and maintain them and to collect revenue from the sale of irrigation service, rests with the districts.

Districts require farmers to pay for basic water services in advance of the season or no water is delivered. Districts have the right to foreclose on farm property in the event of unpaid bills and have done this on a number of occasions. Water delivery to farms is on an arranged demand basis, and deliveries to individual farms are measured volumetrically for accounting and billing purposes.

THE TRANSFER

The Transfer Process

The primary interests of farmers in the transfer were in obtaining more local control over water allocation, water fee structures, O&M expenditures, and drainageways and in minimizing

water charges. In negotiations with the Bureau, farmers and their lawyers asserted the right to local control over a resource for which they were paying, with the underlying assumption that local management would be both cheaper and more responsive.

Bureau officials in the Columbia Basin had a long-standing mandate to transfer management to the farmer-controlled districts as soon as they could reach agreement on the terms and conditions. The Bureau was also interested in shedding responsibility for farm-level water deliveries and water service contracts to enable it to focus on its development mission and on basin-level regulatory functions. These interests were reciprocal. The farmers did not like the cumbersome administration and unresponsiveness of government management and the Bureau did not want the troubles of having to deal with thousands of individual farmers.

In the early 1960s, Floyd Dominy, Commissioner of the Bureau of Reclamation, gave the CBP a strong push to move ahead quickly with transfer negotiations. The districts hired lawyers who, together with elected district board members, entered into a protracted process of negotiation, hydrologic and economic studies, and legal analysis with project staff. The research helped reduce some of the uncertainties about the cost and equity implications of various options being considered. Negotiations began in earnest in 1966, and transfer agreements were signed in late 1968.

Over a period of about five years, the districts gradually came to an agreement over water and cost allocation and which works should be (a) reserved by the Bureau, (b) managed jointly between districts, and (c) transferred to individual districts. Mutual concessions were made by districts regarding alignment of O&M responsibilities and apportionment of costs. One of the last obstacles was overcome when the Bureau dropped its insistence that districts cover severance payments for Bureau staff transferred to the districts.

In 1963, farmers agreed to repay a total of US\$325 per hectare to the Bureau for the cost of scheme construction and additional drainage facilities. This allowed a 10-year deferral period and a repayment period of 50 years, without interest. Hence the repayment rate was US\$6.50 per hectare per year. However, this agreed repayment constitutes only about 12 percent of the total construction costs of the project. The remaining 88 percent is recovered through hydroelectric power sales.

In contrast to many transfer programs in developing countries, the transfer process in the CBP was characterized not by efforts to organize and motivate farmers to comply with government programs, but by extended negotiation until terms and conditions mutually acceptable for the government and the farmers were agreed upon.

Terms of Transfer

The following are the more important terms and conditions which were negotiated and agreed to between the farmer-controlled irrigation districts and the US Bureau of Reclamation. The key rights transferred to the districts include the following.

- * A measurable, volumetric water right.
- * The right to plan and implement all system operations and maintenance.
- * The right to apply fines and other sanctions against members who violate district rules.
- * The right to deny access to water to district members who fail to pay fees or to non-members of the district.
- * Districts can set the levels of basic and excess water charges to farmers, although charges for the basic allocation remain related to land productivity classes.
- * Districts can enter into water service contracts to sell excess water to farmers outside the districts. However, districts may not sell water *rights* since the transfer of water rights from one landholding to another is prohibited.
- * The districts have rights of eminent domain and foreclosure on land. They are not liable for damages resulting from the storage, conveyance, seepage, overflow, and discharge of water either to other districts or to individuals.
- * Districts are allowed to purchase heavy equipment and supplies from the project with a ten-year payment schedule. This includes such vehicles as tractors, road graders, and pick-up trucks.
- * The districts have the right to obtain revenues from sources other than water, including power generated by stations within the system. The right to generate power was considered concessional by the Bureau, since the districts pay an extremely low rate for the primary lifting of water from the FDR reservoir.

Key district responsibilities include the following:

- * Districts must comply with the agreed construction repayment schedule, which includes partial repayment for drainage construction.
- * Districts are responsible for all operation and maintenance for facilities used individually and jointly by the districts, in accordance with Bureau standards of performance and financial viability.
- * Districts are responsible for paying their mutually agreed proportions of the recurrent costs of special "reserved works" which were retained for management by the Bureau.
- * Districts are responsible for making annual payments into a capital replacement reserve fund at a rate equal to 30 percent of five-year average annual O&M costs. They must eventually replace deteriorated facilities using this fund.
- * Districts must report maintenance plans annually in advance to the Bureau.

Key rights held by the Bureau after transfer were as follows:

- * The Bureau has the right to resume direct management of the system if the districts fail to make their construction repayments, pay for the O&M of reserved works, or properly maintain the system.
- * Bureau staff members affected by the management change would be transferred either to other Bureau projects (as was the case with most construction staff

members) or to the districts themselves (as was the case with most O&M staff members). By agreement, most of the initially-employed district management staff members were former Bureau CBP employees.

- * Salaries and benefits of transferred Bureau staff members such as ditchriders and watermasters remained at the levels prevailing before transfer. Federal retirement plans for transferred staff members were cashed in or suspended and new district retirement plans were started, although without seniority.

Key responsibilities of the Bureau relative to the districts, after transfer, were as follows:

- * The Bureau has responsibility to manage the "reserved works" which serve the entire project. These included the Grand Coulee Pumping Plant, Banks Lake, the Main Canal, and Potholes Reservoir.
- * The Bureau conducts operation and maintenance reviews (or "examinations") every three years to audit O&M performance standards of the districts and make recommendations for improvements.
- * The Bureau retains ownership of the facilities operated by the districts at least until completion of repayment or replacement of facilities by the districts. However, under current law, wholesale transfer of ownership of system facilities to the districts would need an act of Congress. The districts favor the retention of legal title for facilities by the Bureau, since they believe this protects them from certain legal liabilities.
- * The Bureau must report, in advance, its maintenance and repair plans for its reserved works to the districts on an annual basis.
- * The Government will acquire needed rights-of-way for water movement within the project area.

The negotiations between the Bureau and the districts regarding the terms and conditions of the transfer were complex and occurred over the course of several years. A legal council was involved on both sides and political influence was sometimes invoked by the districts. The results were embodied in a set of three legally binding transfer agreements, which were, in essence, contracts between each district and the Bureau of Reclamation. These agreements remain in force.

The strong legal position of the farmer irrigation districts and the protracted period of negotiation between them and the Bureau resulted in a relative balance between district rights and responsibilities. In developing countries there is a tendency for governments to emphasize transfer of responsibilities to the neglect of transfer of rights. A balance between transferred responsibilities and rights, and expected increase in local control and net financial gain to the farmers, were motivating conditions which made the transfer acceptable to CBP farmers. Where this is not the case, considerably greater resistance to transfer on the part of farmers is probable.

IMPACTS OF THE TRANSFER

Technology Adoption

There was substantial technological change in the CBP following transfer of management in 1969. Some of this change, such as the widespread shift from open channel water application to center pivot systems, resulted from individual decisions of farmers responding to prices and returns. Other changes, such as installation of automatic gaging stations and telemetry systems, were initiated by the districts. It seems clear that the transfer to district management has not hindered the adoption of new technology in the CBP and may have accelerated it.

Causes and effects of technological change are sometimes complex and indirect. For example, the reduction in water demand which accompanied the rapid shift to sprinkler irrigation in the 1970s was shown to be largely a result of a shift to crops with lower water demand, rather than to the adoption of more efficient sprinkler systems *per se*. However, it is likely that the installation of center pivots improved water control and facilitated the shift to new, less water intensive, often higher value crops. The willingness of farmers to invest in expensive new water application technology is itself, in part, a function of their confidence in the reliability of water supplies delivered by the district. District managers assert that the shift to center pivot irrigation has also had implications for main system management, requiring less frequent changes in turnout settings, but causing larger, more abrupt changes in demand, leading to increased main system losses.

Hydrologic Performance

The quality of the irrigation service received by CBP farmers does not appear to have been affected significantly by the change to district management. Quantity of water delivered did not change markedly after 1969 and reductions in water supply in later years can be explained largely by reductions in aggregate water demand resulting from changing cropping patterns. Demand-based equity of water distribution among the districts did decline in the 1970s and 1980s following transfer, but then improved again and, on average, equity among districts was about the same before and after transfer. The CBP operates on an arranged demand system of allocation wherein timeliness of water deliveries must be measured against the timing of orders for water. Farmers appear to have been satisfied with the timeliness of deliveries both before and after transfer and generally rate this aspect of service highly.

An examination of the hydrologic efficiency of the system reveals some interesting changes (Figure 1). It appears that the system's new managers had a learning period of five or six years after transfer before they were able to operate the conveyance system as efficiently as did the Bureau prior to transfer. This demonstrates the complex and subtle nature of the control that is required to operate a large system like the CBP efficiently. Farmers increased tertiary-level efficiency steadily from the mid-1970s. Improvement in water use efficiency was driven by a shift from surface to sprinkler irrigation across much of the project area. That rise has now stopped and overall tertiary-level efficiency may even be declining slightly at present.

One very puzzling aspect of system hydrology is the continuing 15-year decline in conveyance efficiency which began in 1978. This decline appears to be a result of deterioration in the condition of major system canals resulting in increased conveyance losses. Evidence from the maintenance audits conducted by the Bureau, supplemented by statements of project managers, lends support to the idea that system facilities are deteriorating (Table 1). Whether or not this has resulted in increased conveyance losses is not known with certainty but it is reasonable to assume so.

Financial Performance

Upon assuming management responsibility, districts moved quickly to cut water assessments to district members. On average, real per-acre assessments (adjusted for inflation) under district management were only 78 percent of their level during the Bureau period, dropping from approximately US\$27 per acre in 1969 to US\$21 per acre in 1989 (Figure 2). At the same time, districts diversified income sources, increasing the share of revenue from hydropower generation, water sales and interest on deposited funds. This partially offset lost water assessment income (Table 2). Sale of water to non-members of the district also increased sharply, demonstrating the power of vested water rights, financial autonomy, and quasi-volumetric pricing to shift water to more profitable uses within the irrigation sector.

On average, costs of operating the system do not exhibit well-defined shifts associated with management transfer, and average expenditure levels before and after 1969 are roughly similar. Although it is impossible to know what expenditure patterns would have prevailed had the Bureau retained operating responsibility, the Bureau's agency-wide O&M cost index has grown to a higher level than more general cost indices, suggesting that CBP operating expenses under Bureau management might have been higher than they presently are, other things being equal.

Three-quarters of operating expenses are made up of staff and O&M costs, and, ignoring the one-time costs of the transition, these have held remarkably constant across the transition. However, USBR staff levels have fallen sharply since 1969, above 500 in 1969 to below 100 in 1983 (Figure 3). Major expenditure components show peaks just after transition, reflecting the one-time costs of the transfer. A ten-year decline in total expenditure from the 1969 peak is largely attributable to falling costs of reserve works. During the last decade, total costs have risen again to their long-term average, driven by increases in reserve works expenditures (which include primary pumping costs and costs of maintaining the main system components serving all three districts) and administrative and other costs.

Since district O&M costs have not declined since transfer, it can be assumed that maintenance levels at the district level have not been reduced appreciably. However, conveyance efficiency has declined in all three districts. It is possible that, while district expenditures on O&M have held constant, they should in fact be increasing to counter accelerating deterioration as the system ages. Some support for this hypothesis is provided by an analysis of maintenance audits, which show an increasing number of problems being flagged in recent years (Table 2). This would suggest that if O&M expenditures continue to hold constant, gradual system deterioration will

continue and that more general rehabilitation will be required in the future.

Farm Profitability

Gross returns to irrigated agriculture have risen steadily in the CBP over the past 30 years (Figure 4). Although information on net returns is sketchy, there is some indication that real net returns have risen also. Water assessment levels have fallen by about one-third since districts assumed management responsibility. This is very roughly estimated to comprise about 15 percent of average net farm income.

ENABLING FACTORS

Policy Context

The established federal government policy mandating transfer to farmer management of all irrigation systems constructed by it gave the transfer an air of inevitability. It also meant that considerable experience with the transfer process had accumulated before transfer was attempted in the CBP. Farmers were brought into the picture at the outset through their irrigation districts. Their agreement to participate in the project, to undertake partial capital repayment, assume eventual management of the project, and to cover the "full" cost of O&M (which in fact is only partial) was required. The offer could be refused and was by some. The legally binding nature of the agreements reached provides a sense of legitimacy for the districts in the eyes of farmers and permits strong sanctions to be applied by the districts against members, when required.

Federal policy also requires a continuing Bureau presence in the project as a repository for the project water right, the legal owner of the system physical facilities, and provider of ultimate oversight. This presence is also valued by the districts as it offers certain sovereign immunities and an ongoing relationship with the Bureau. The "partnership culture" between the districts and the Bureau permitted joint problem-solving during the transfer, leading to a mutual decision to continue Bureau management of jointly-used reserved works, contracting by the districts for technical work to be performed by Bureau staff, and the creation of satisfactory Bureau-to-district personnel transfer arrangements. The relationship is currently being utilized in implementing a program of artificial drainage installation within the project and could possibly facilitate future assistance for system rehabilitation or major repairs.

Federal water resource policy allows cross-subsidization of irrigation construction costs by power revenues and this tends to increase the profitability of irrigated agriculture under Bureau projects. By providing power for lifting water at rates which are far less than current market rates, the government continues to subsidize system operating costs. The government charges the districts only 1/2 cent per kilowatt hour for pumping water out of the Columbia River. The open market price for electricity during the summer season is approximately 17 cents per kilowatt hour. However, within this subsidized context, irrigation districts are required to operate with balanced budgets.

Perhaps most importantly, federal irrigation policy has remained fairly constant since its inception. Although there have been changes in particular features from time to time, the basic outlines and the principle of system management by financially autonomous irrigation districts have remained. This consistency provides farmers with the confidence to make investment decisions and other longer-term commitments which might otherwise seem excessively risky. It also provides the assurance that private investments which they might decide to make will not be duplicated or provided to others at no cost at some future date.

Social Context

By contrast to the situation in many developing countries, the project area consisted originally of a relatively homogeneous population of settlers who were well educated and commercially oriented. There were virtually no landless poor or others with insecure tenure resident in the project area. Farmers were experienced at creating voluntary associations for a variety of purposes and appreciated the usefulness of joint action. Farmers and their districts had considerable legal and political power and secure land and water rights. Farmers were able to negotiate as equals with the Government and obtained numerous favorable concessions for themselves, such as low power and construction repayment rates and relaxed limits on farm sizes. Such concessions ensured that farming would be a relatively stable and profitable enterprise. Initially farmers employed their considerable political clout to influence Bureau decisions through their elected national representatives. More recently, farmers have begun to rely more heavily on legal action to pursue and promote their interests in the public arena.

Institutional Context

A number of important institutions undergird the successful assumption and execution of management responsibilities by the three CBP irrigation districts. Fundamental is the existence of a reliable system for specifying, allocating and recording rights to the use of water. Without this, it is unlikely that farmers would have been willing to assume responsibility for the common irrigation facilities and make the requisite corollary private investments in on-farm equipment and facilities. The strong legal basis underlying the creation of quasi-municipal irrigation districts also contributed to successful devolution and management by the districts. The relative autonomy of the districts allows them flexibility to control costs and to diversify sources of income. The relationship between the Bureau and the districts rests on a set of repayment contracts which spell out the duties and obligations of each party. The legitimacy and enforceability of these contracts is an important feature of transfer. Supporting and enabling all three of these institutions—firm water rights, legally constituted quasi-municipal irrigation districts, and contract law—is a relatively impartial and accessible legal system which provides a mechanism for enforcing contracts and adjudicating disputes.

Another area in which underlying institutions are important is that of financial probity. The state, which charters the districts, requires that regular audits of district accounts be carried out by certified public accountants. This system of mandatory external audits is another important element in the institutional environment facilitating the viability of the irrigation districts.

US Bureau of Reclamation

The Bureau of Reclamation has been characterized by a high degree of competence and professionalism both before and after transfer. Bureau staff receive salaries which provide for an adequate standard of living and enjoy job security under the federal civil service system. That security was preserved during the transfer process, since most staff were transferred to new positions with the districts, retaining former salary levels and insurance and pension benefits. Remaining staff were reassigned elsewhere, accepted early retirement, or were given new roles within the Bureau. These steps no doubt helped limit opposition on the part of affected Bureau employees which might otherwise have been considerable.

It is noted that the Bureau is not financially autonomous in the sense that its operating expense budget is unconnected with the revenue its activity generates. The three CBP irrigation districts do meet this criterion. Financial autonomy has been identified as a key attribute of effective irrigation service providers in developing countries (Small and Carruthers 1991; Svendsen, Adriano, and Martin 1990) and appears to play a critical role here as well.

Irrigation System

The physical elements and basic operating rules of the irrigation system also form a relevant part of the transfer context. First, the system has an ample and reliable water supply. Second, allocation has been capably handled on an arranged demand basis both before and after transfer. This permits considerable flexibility and responsiveness to market conditions by farmers in choosing crops and cropping patterns. Third, there are clear points of demarkation of responsibility and control where transfers of measured quantities of water are undertaken according to widely accepted agreements and rules, including payment rules. Deliveries to districts and to individuals are thus treated as contractual obligations and water is regarded as an economic good rather than a social entitlement. Fourth, the system has adequate conveyance capacity to deliver required amounts of water throughout the system. Fifth, system physical facilities were upgraded as a part of the transfer agreements and were received by the districts in good working order. The transfer was thus not the disposal of a dilapidated public property, but rather the concessional sale of a valuable and productive asset. Additionally, much of the technical expertise needed to operate the system was transferred with it through the hiring of Bureau staff members by the districts.

LESSONS FOR TRANSFER IN DEVELOPING COUNTRIES

Lessons which can be taken from the CBP experience for use in developing country settings can be grouped into two categories. The first of these comprises policy and institutional issues which can affect the success of a transfer program. The second relates to the process of transfer itself.

Policy and Institutional Issues

An assessment of the relative effectiveness of the various policies and conditions supporting successful transfer of management responsibility in the CBP is beyond the scope of this paper. Moreover, large public irrigation systems occur in a tremendously wide range of situations around the world, and even if such an assessment were carried out, the lessons learned could not be conveyed directly to new settings.

Nevertheless, it is possible to identify from the preceding analysis some policies which appear to have been influential in enabling a successful transfer of management responsibility. Some of these factors will be important only in the context of this particular case, or a relatively narrow range of cases, while others will have more wide-ranging importance. Listed below are policy conditions which are judged to be important and to possess a measure of general applicability. They are recommended not for immediate and uncritical implementation but for careful consideration of their relevance for particular situations by planners and managers of management transfer programs in developing countries.

- * *Put in place a clear and consistent policy mandating irrigation management transfer.* Transfer is a slow and deliberate process, and basic outlines of policy governing transfer must remain relatively constant for an extended period to elicit desired responses. Where policy on transfer shifts repeatedly, meaningful and sustainable change is unlikely to occur. On the other hand, the USBR experience in general, and the CBP experience in particular, demonstrates that where sustained commitment to the practice of transferring system management responsibility exists, the process can work effectively.
- * *Do not require full cost recovery* (for both capital and operational costs) in the first instance. In most cases, such insistence will result in such a drastic increase in the farmers' costs for irrigation service which may place any proposed management transfer program into a sea of political protest. Cross-subsidizing irrigation service delivery costs with other water resource-related revenue streams, such as power generation or aquaculture, maybe a more practical option.
- * *Manage financial autonomy* (on the part of the managing entity). This has been shown to be effective and critically important in a wide variety of circumstances in both higher and lower income countries. Causing the irrigation district or farmers' organization to generate sufficient income to cover its costs in operating the system provides an essential set of feedback links needed to make system management accountable to its members. It is not necessary that no public subsidies be involved, but only that they be specified in such a way that they do not increase automatically to make up shortfalls in revenue from irrigation operations.