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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. There 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 multi-purpose 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, 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 5 to 7 person board elected from among them. The districts operate on a non-profit 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 service 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.

¹The study on which this paper is based is reported more fully in Svendsen and Vermillion 1994.

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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 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 ha 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 ha 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 operation 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 included such vehicles as tractors, road graders, and pick-up trucks.
- * The districts have the right to obtain revenues from sources other than water fees, including developing power generation 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 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 with 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 affected by the management change would be transferred either to other Bureau projects (as was the case with most construction staff) or to the districts themselves (as was the case with most O&M staff). By agreement, most of the initially-employed district management staff 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 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 take 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. 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 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 this is reasonable to assume.

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 includes 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 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.

- * *Provide a strong legal basis for irrigator organizations.* Such organizations should have the authority to make contractual agreements, obtain credit, and apply sanctions against members.
- * *Provide a system of secure, well-specified and long-term water rights* which can be assigned to irrigation systems to offer security for investments of time and money.
- * *Invest to bring physical facilities up to standard.* Experience in a number of countries, including the United States, has shown that programs which couple physical upgrading (if needed) with transfer are more likely to succeed than where transfer of systems with faulty infrastructure is attempted.
- * *Create a fair and transparent professional auditing system* and mandate its use by managing organizations. This system can be established in either public or private sectors, but should be carefully regulated to ensure its integrity.
- * *Provide new employment or compensation for displaced irrigation agency staff.* Civil service employees of public irrigation agencies often have considerable political influence and must not see themselves as losers in the transfer process. They should be integrated into the planning for the transfer and compensated for lost employment through early retirement inducements or transfers to new positions.

Process Issues

The following issues relate to the processes employed in facilitating management transfer. Some of these have policy and institutional implications which should not be ignored. In general there is a well developed literature and body of experience with the process of organizing farmers into associations. (FAO 1985; Uphoff 1986; Korten and Siy 1989; Uphoff 1992) Less attention has been devoted to some of the other factors in the listed below.

- * *Involve farmers early on in the planning for the transfer.* A sense of full partnership in the process on the part of farmers is essential for successful assumption of responsibility.
- * *Empower farmers* to successfully negotiate with the public irrigation agency. This is difficult to do, though one new approach worth exploring is the vesting of farmers groups with water rights, rather than granting them to the managing agency.
- * *Use contracts* between irrigator groups and the managing agency to specify roles and responsibilities. This can be a very powerful tool as it implies a voluntary relationship between equals and creates mutual obligations and rights, i.e. mutual dependencies.
- * Develop a locally appropriate water allocation system with *volumetric measurement and payment* at some level. Measurement does not have to be at the level of the farm turnout, as in the CBP, but can apply to groups of farms and farmers.
- * *Provide experience* with organization and management for farmers and farmer leaders. This is a central subject of the farmer organizational literature mentioned above.
- * *Provide assistance* to operating agencies to improve management and human relations skills. Technically trained personnel often lack this kind of expertise which they need to work effectively in a decentralized management environment.
- * Specify an *ongoing role for the operating agency* in "partnership culture" with the farmer-based organizations assuming management responsibility. Experience has shown that there often remain tasks which a public agency is better equipped to perform. Relative comparative advantage should be clearly identified and means for continued cooperation worked out.

CONCLUSIONS

From many angles, the transfer of management from the US Bureau of Reclamation to irrigation districts in the Columbia Basin Project can be considered a success on a large scale. While the Bureau was able to back out of its partly unwanted role in O&M, the districts gained local control over management and costs. This was an extended process, beginning in 1939, 13 years before water began flowing through the irrigation system, and culminating with the signing of the transfer agreements 30 years later.

The study made a concerted effort to document the hydrologic and financial results of the transfer. In general, there appears to have been little or no effect on the quality of irrigation service received by farmers. Service was of high quality before the transfer and it remained so afterwards. However conveyance efficiency in the main and branch canals of the three districts declined following transfer and took five or six years to recover to previous levels. This is interpreted as a learning period, during which the new managers learned to operate the system efficiently. Subsequently a long steady decline in conveyance efficiency set in which is thought to be a result of a failure to keep up with increasing maintenance demands as the system ages. Even though system O&M expenditures held roughly constant, in real terms, before and after the transfer, an increasing number of maintenance problems were observed as time passed, suggesting that maintenance requirements were accelerating.

In the wake of the transfer in 1969, Bureau staff levels fell dramatically, and the Bureau assumed new roles as a wholesaler of water, an environmental regulator, and a water resource planner and manager. Many of the staff released by the Bureau were subsequently reemployed by the districts providing some operational continuity, but the managers of the districts were selected from outside this personnel pool.

Districts moved quickly to develop supplementary sources of income and to reduce operating expenses and water charges to district members. Supplementary income sources included investment income, power generation revenues, and sales of water to non-district members. Average water charges following transfer were only 78 percent of their level during the Bureau period. Real gross returns to irrigated agriculture have risen steadily in the CBP over the past 30 years with some indication that net returns have risen also. This trend appears unrelated to the management transfer. The fall in water assessment levels as a result of the transfer, however, appears to have increased net farm income by about 15 percent.

It is impressive that management of irrigation for 230,000 thousand hectares (with approximately 7,000 landholders) can be handled by three local irrigators' organizations. Indeed this is a recurring pattern throughout the American West, even on larger scales. The King's River Irrigators Association near Fresno, California, for example, successfully services an area more than twice as large as the CBP. A number of lessons relevant to developing country policy makers and implementers emerge from this experience. These do not comprise a prescription for change, but are factors which should receive serious consideration in planning programs involving transfer of irrigation management responsibility to farmer-based groups.

References

Food and Agriculture Organization of the United Nations (FAO). 1985. Participatory experiences in irrigation water management. Proceedings of the Expert Consultation on Irrigation Water Management held in Yogyakarta and Bali, Indonesia, 16-22 July, 1984, sponsored by Government of Indonesia and Food and Agriculture Organization of the United Nations, United States Agency for International Development. FAO, Rome.

Korten, F. and R. Siy. 1989. Transforming a bureaucracy. Manila: Ateneo De Manila University Press.

Small, L., and I. Carruthers. 1991. Farmer-financed irrigation: The economics of reform. UK: Cambridge University Press.

Svendsen, Mark, and Douglas Vermillion. 1994. Irrigation management transfer in the Columbia River Basin, USA: lessons and international implications. IIMI Research Paper. Colombo, Sri Lanka: International Irrigation Management Institute.

Svendsen, M., M. Adriano, and E. Martin. 1990. Financing irrigation services: A Philippines case study of policy and response. International Food Policy Research Institute, Washington, D.C., International Irrigation Management Institute, Colombo, in collaboration with the National Irrigation Administration, Manila.

Uphoff, N. 1986. Getting the process right: Improving irrigation water management with farmer organization and participation. A Working Paper prepared at Cornell University for the Water Management Synthesis II Project, Consortium for International Development, USAID. Cornell University, New York.

Uphoff, N. 1992. Learning from Gal Oya: Possibilities for participatory development and Post-Newtonian social science. New York: Cornell University.

Map 1. The Columbia Basin Project.

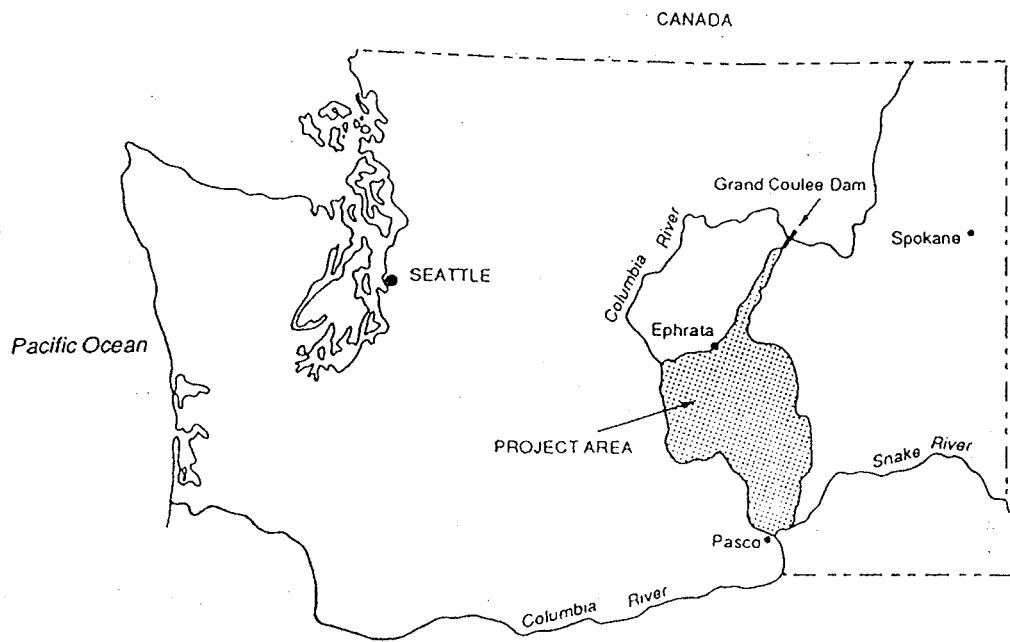


Table 1. Results of the USBR O&M audits in the three districts of the CBP.

Number of Recommendations					
			New Recommendations		
Year/s	Previous Recommendations Uncompleted	Category 1	Category 2	Category 3	Total
1973	2	0	0	0	0
1975	0	0	5	1	6
1977	3	0	0	1	1
1979-81 ^a	4	0	12	2	14
1982-84	1	0	8	2	10
1986-88	3	0	5	1	6
Total	13	0	30	7	37

Source: O&M audits, USBR, Columbia Basin Project.

Note: Category 1: Urgent remedial maintenance required; Category 2: Important preventive maintenance needed; Category 3: Less important, preventive maintenance would help improve O&M.

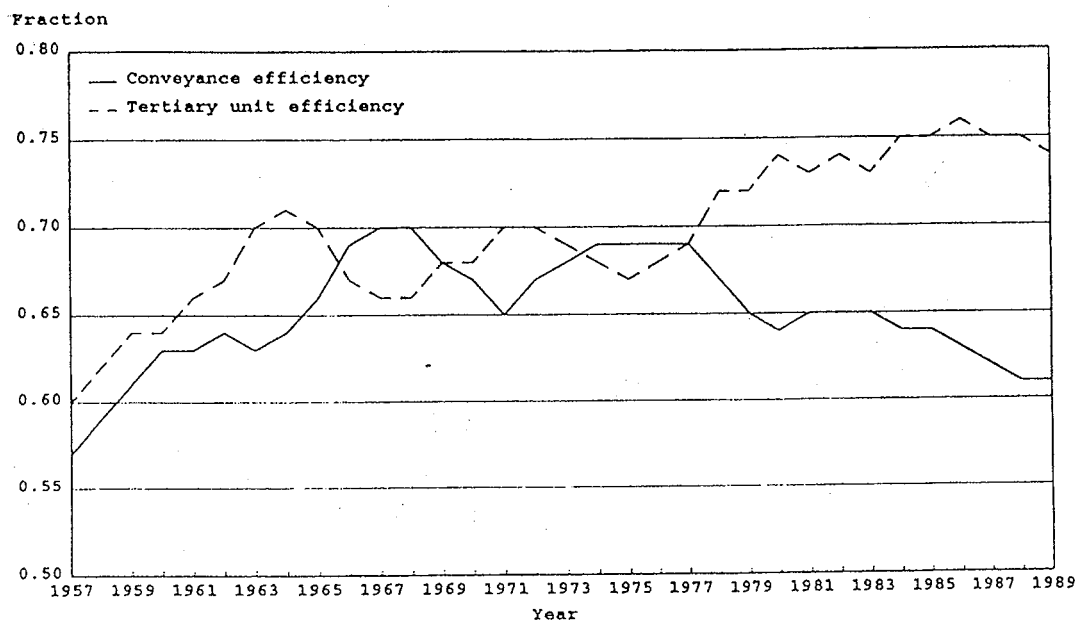
^a In later years, audits were not conducted in each district during the same year.

Table 2. Share of total revenue, 5-year averages, the CBP, 1969-89.

Year	Water Assessment	Water Service Contracts	Excess Water Charges	Interest and Other Income	Power Revenue	Total
1969	0.806	0.003	0.122	0.070	0.000	1.000
1970-74	0.764	0.014	0.126	0.095	0.000	1.000
1975-79	0.778	0.033	0.116	0.075	0.000	1.000
1980-84	0.729	0.042	0.060	0.166	0.004	1.000
1985-89	0.674	0.057	0.076	0.148	0.045	1.000

Source: Data from CBP irrigation districts.

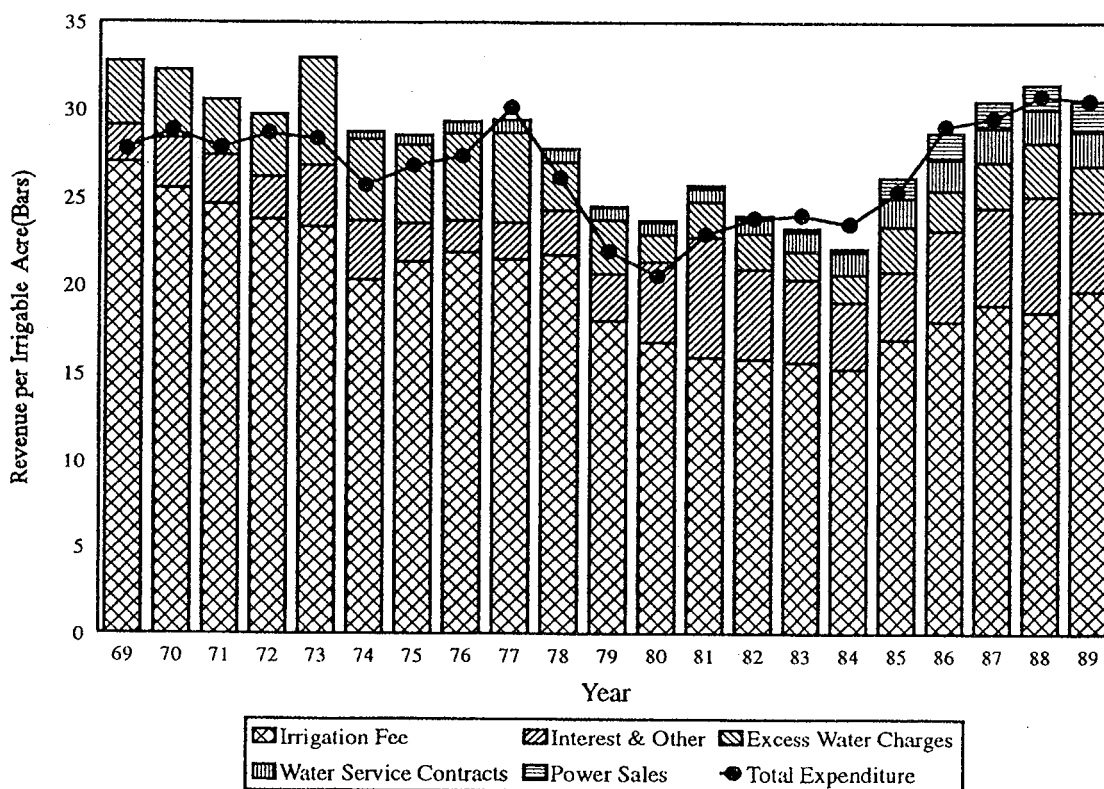
Figure 1. Conveyance and tertiary unit efficiency for the three CBP districts, 1955-89 (3-year moving average).



Source: Water Distribution and Crop Production Reports for the CBP, U.S. Bureau of Reclamation

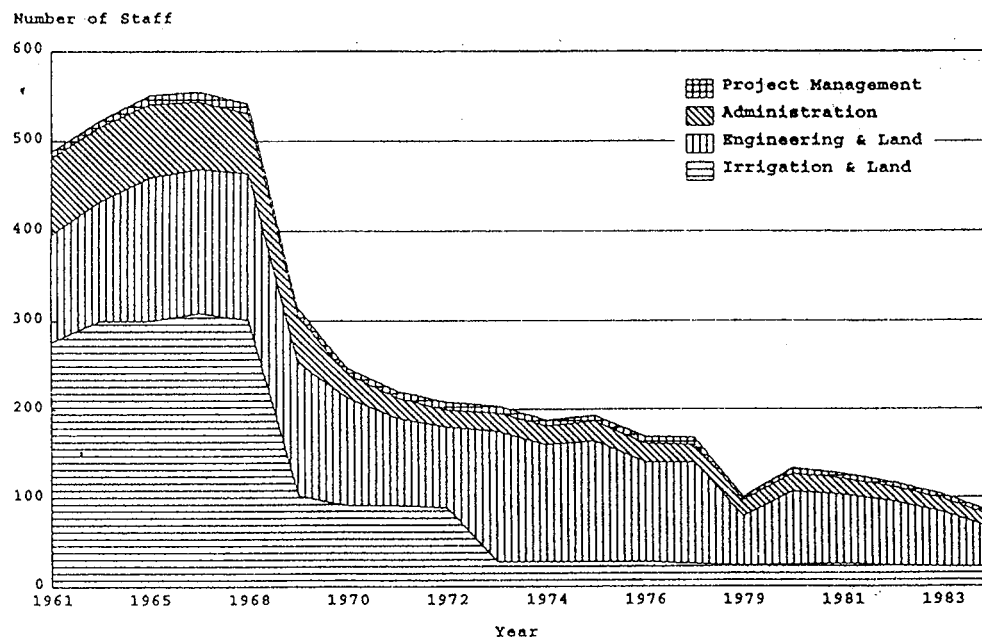
Note: Years shown on graph scale are final years in each 3-year period.

Figure 2. Revenue and expenditure per irrigated acre, the CBP, 1961-89.



(Adjusted for inflation, in 1989 Dollars)

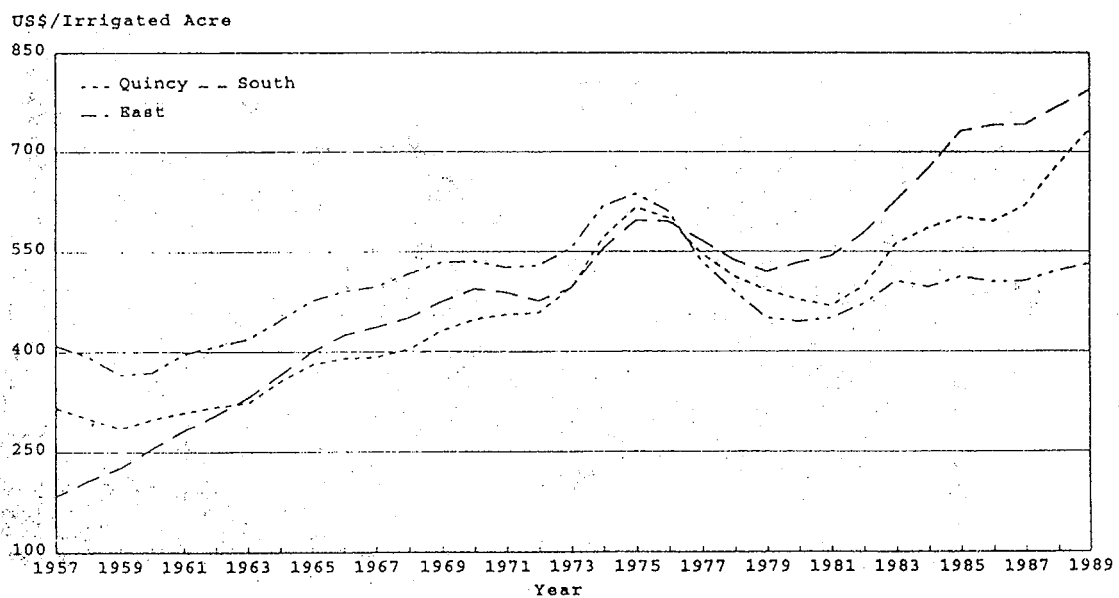
Figure 3. Number of USBR staff assigned to the CBP, by division, 1961-85.



Source: U.S. Bureau of Reclamation data

Note: Data are missing for the years 1962, 1964, 1966, 1978 and 1984. Figure excludes Power Division which became independent in 1969.

Figure 4. Average value of total crop production per acre, the CBP, 1960-89 (3-year moving average).



Source: Crop Production Reports for the CBP, U.S. Bureau of Reclamation. President of the United States, Economic Report of the President (Washington, D.C.: U.S. Government Printing Office 1991).

Note: Prices adjusted by index of prices received by farmers in the U.S.A., (1982=100).