Privatization and Self Management of Irrigation in Developing Countries

Annual Progress Report for 1994

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

by the

Local Management Program
International Irrigation Management Institute
Colombo, Sri Lanka

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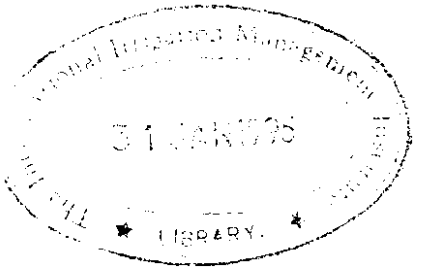

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Project Name:	**Privatization and Self Management of Irrigation**
Submitted to:	**Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH**
GTZ Office:	**International Agricultural Research**
Project No. :	**91.7860.9-01.288**
Contract No.:	**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 fur 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 **8.** Johnson, J. Brewer, M. Samad, C. Garces-Restrepo, Mark Svendsen and Wim Kloezen.

..2 Objectives and Activities

The objectives and activities for Phase 1 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 imgation agencies, IIMI has conductea 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 imgation 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 imgation 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 imgation 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 imgation 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 Imgation, review of literature and information obtained through workshops and networking, IIMI has identified key problems arid 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 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 Shff 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. Beind 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 imgation 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 generalizeability 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 (Svendsen 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 thud 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 fanners 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 tumover or privatization requires that a set of essential conditions be puf 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 gov'emment 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 fanner 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 fanner 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 fanners 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 fanners. Where the government retains a role in providing future assistance to farmer managed imgation 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 fanning 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 (IIMI, 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 imgation 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 imgation 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 join: 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 counmes 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 contact "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 fanners' 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 imgation 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 imgation 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-tern 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 imgation districts. These districts had been established in 1939 while construction was stilt 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 fanners 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, fanners 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 fanners, although charges for the basic allocation remain related to land productivity classes.
* Districts can enter into water service contracts to sell excess water to fanners 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 nonmembers 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 our 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-tern 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. Fanners 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 fanners 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 dishicts, requires that regular audits of district accounts be carried out by certified public accountants. This system of mandatoryexternal 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 transfemng 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 imgation 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 transfer of systems with faulty infrastructure.

* *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 he carefully regulated to ensure its integrity.

* *Provide new employment or compensation for displaced irrigation agency staff.* Civil service employees of public imgation 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 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 farmer 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 fanner 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 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 fanner-based groups.

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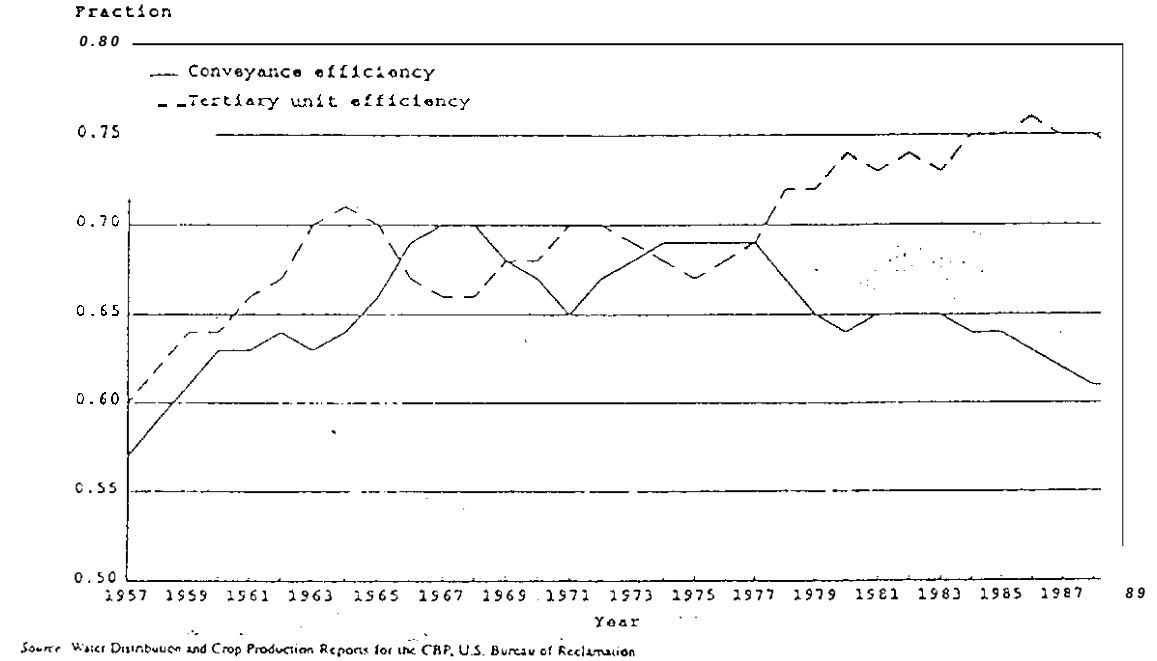
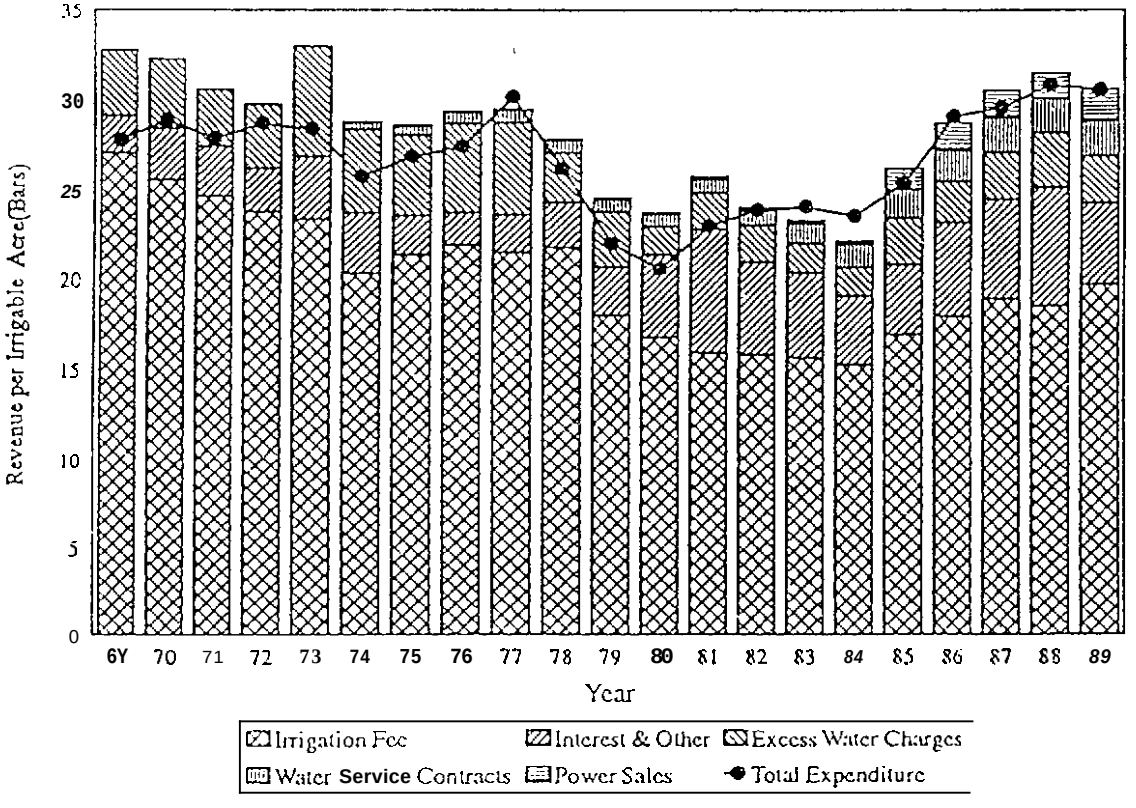
Figure 1. Conveyance and tertiary unit efficiency for the three CBP districts, 1955-89 (3-year moving average)



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

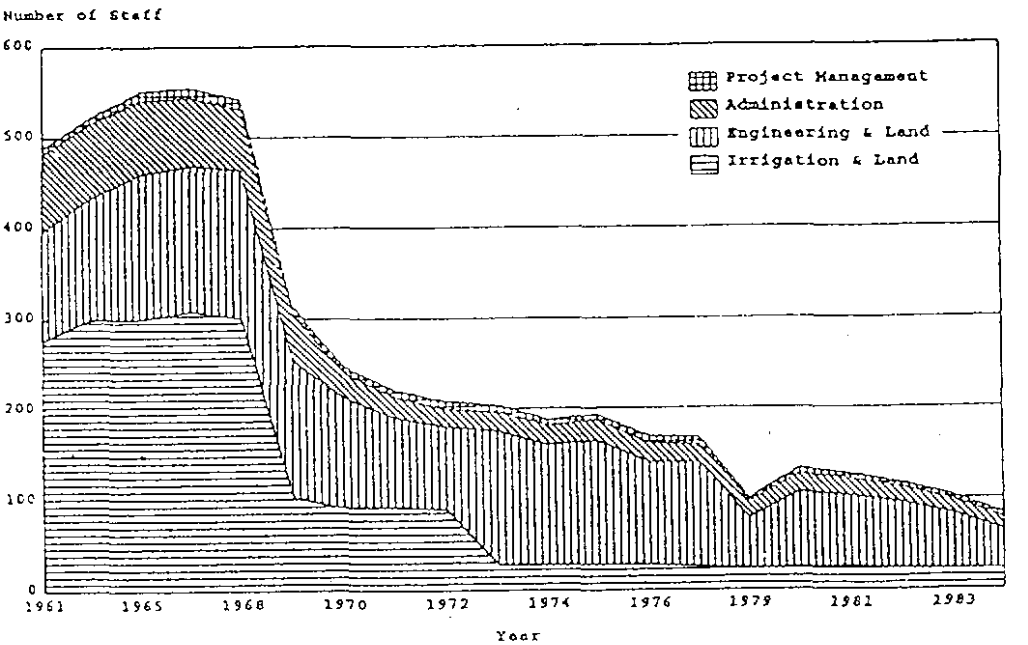
Note: Years shown on graph scale are final years in each 3-year period

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



(Adjusted for inflation, in 1989 Dollars)

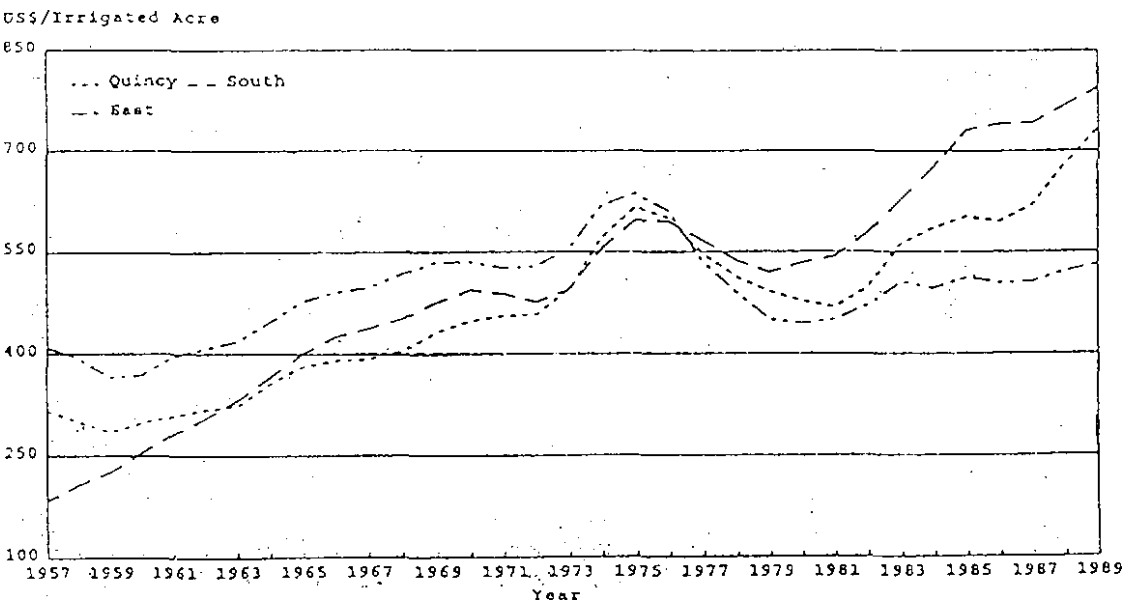
Figure 3. Number of USBR staff assigned to the CBP, by division, 1961-85.



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).

Map I. ***The Columbia Basin Project.***

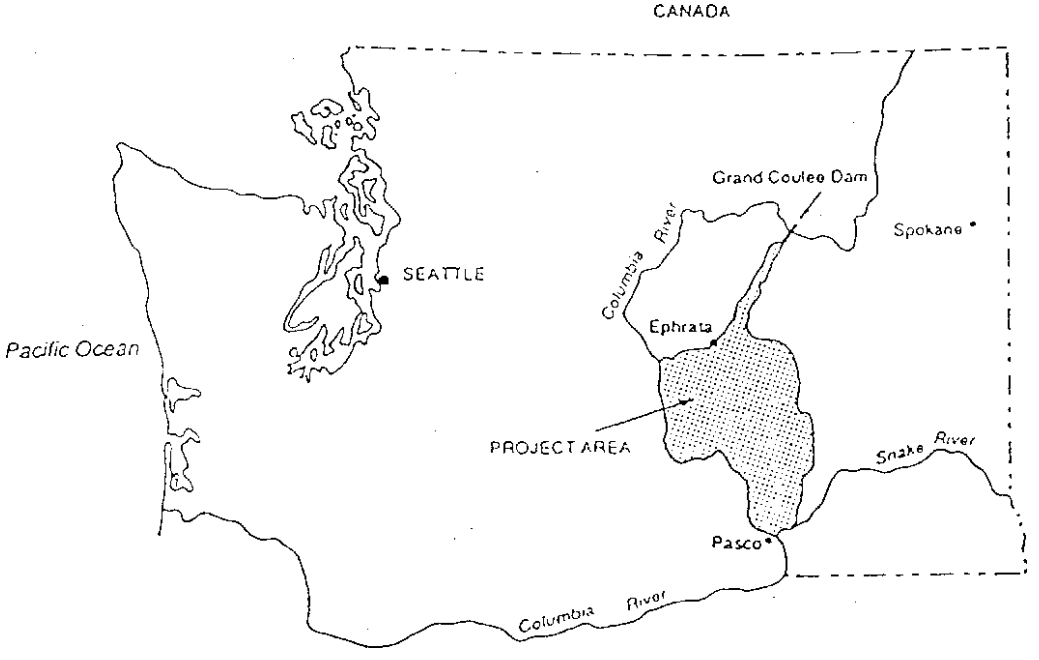


Table 1. Results of the USBR O&M audits in the three districts of the CBP.

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			
1979-81	4	0	12	2	14
1982-84	1	0	8	2	10
1986-88	3	0			
Total	13	*0*	30	7	37

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

3.2 Case Study on Irrigation Management Turnover in Colombia

As in many other countries of the world, Colombia is currently engaged in an Irrigation Management Transfer (IMT) program of its public irrigation systems (known as "districts") to the private sector. Unlike other countries, however, Colombia had experimented with the turnover issues as early as 1976 when the districts of Coello and Saldaiia (at that time being administered as a single unit) were handed over to the reorganized Water Users Associations.

Study Plan Given that IIMI's Local Management of Irrigation Systems and Turnover Program Theme was engaged in the documentation of IMT case studies in order to advance its understanding about what factors lead to successful or unsuccessful results from turnover, and that IIMI's emerging Latin American and Caribbean Program was trying to identify regional research priorities to being its activities, the two programs decided that it would be both convenient and cost-effective to combine their efforts by undertaking an IMT study in Colombia, in order to document the impact of the transfer. Field research for this study began in April 1, 1993 and was extended until April 1994. The study consists of two components:

1) an in-depth assessment of irrigation management performance in the districts of Coello and Saldaiia before and after transfer, including a review of the transfer process; and

2) an overview of the management transfer policies (past and present) and issues, as well as brief descriptions of the transfer process in eight systems that have been turned over.

In line with these two components, the study seeks to accomplish the following four objectives:

a) Document key aspects of agricultural, water delivery, economic and financial performance of the two systems before the management transfer;

b) Document the process of management transfer in the two systems, including changes in management roles, the change process and perceptions of different groups involved;

c) Provide an overview of irrigation management transfer in Colombia at the national level, including the agro-ecological, policy, legal, technical and socio-economic context, past and current issues related to the transfer process, extent and nature of transfer;

d) Produce a Research Paper, Short Reports and other publications from the study.

Component 1 involves, among others, the following tasks:

- review existing studies on Coello and Saldaña
- inventory of existing data available

- review national transfer policy documents
- review system procedures and actual practices and problems for water acquisition and distribution, O&M budgeting, revenue raising, etc.
- identify steps taken in the management transfer process, including motivating conditions for the transfer and perceptions of different actors
- describe outstanding issues or disputes related to IMT
- document organizational charts before and after IMT
- assess validity and reliability of data recorded, calibrations and measures of sample discharges, check crop yield reports
- conduct IMT survey of selected farmers, district and agency staff and WUA board to assess impact of IMT.

Component 2, the national IMT overview, includes the following:

- description of agro-ecological zones in Colombia
- overview of the development of irrigated and irrigated agriculture in the country
- description of changing roles, if any, of different organizations involved in irrigated agriculture as a result of the transfer process
- description of the IMT development process in Colombo
- assess key elements of the country's Land Development Law and its implications for IMT
- description of the Government's plan and timetable for IMT
- description of national-level investment in imgation construction, rehabilitation, O&M, etc. for the past, present and near future.

Study arrangements and activities IIMI hired a local Colombian consultant responsible (Mr. Juan Femandez, agricultural engineer) for both information gathering and field activities. He is currently working in close cooperation with HIMAT personnel who provides logistical support and facilitates IIMI's consultant interaction with the administration and WUA of the various districts under study. IIMI international recruited staff provided technical support through short-visits to the country. Two preliminary papers from the study were prepared by Drs. Garces-Restrepo and Vermillion and were presented at the international conference in Wuhan, China and published in IIMI's Short Report Series.

The following is a summary of some of the main findings of the study.

INTRODUCTION

Management Transfer

Since the 1980's many countries around the world have embarked on programs to transfer management for imgation systems from government agencies to water users associations. Generally, the policy reflects the need to reduce government expenditures for recurring costs of irrigation management by line agencies (Vennillion, 1992). Transfer policies also reflect a recognition that government agencies have not been very effective in managing irrigation systems according to fanner demands (Repetto, 1986). Transfer proponents generally assume that farmers are capable of taking over management and have greater incentive than government agencies to improve cost efficiency and keep their systems financially and physically sustainable.

Management transfer may involve outright privatization of ownership of imgation structures (Farley, 1994; Gazmuri, 1994) or it may only involve mobilization of farmer resources to manage systems (Wijayaratna & Vermillion, 1994). Where fanners are already paying for the cost of irrigation services there is some evidence that fanners are more willing to take over management from the government (Svendsen & Vermillion, 1994; Vermillion & Garces, 1994). But in many cases, especially in developing countries, governments have failed to collect irrigation fees and are forced to transfer management for financial reasons. In these cases, management transfer comes at the initiative of the government and means an increase in the cost of irrigation to fanners (Vermillion, 1991). Somewhat problematical, transfer policies have been occurring during a time when world grain prices have been on the decline.

In Latin America, privatization has generally been imposed by governments rather than the private sector (Glade, 1991). However in 1975 in Colombia, prior to the wave of privatization in the 1980's, fanners in the Coello and Saldaña irrigation districts exerted pressure on the government to take over management of the irrigation systems (Plusquellec, 1989). In contrast. to many situations, fanners in these systems had already repaid 90 percent of system construction costs and were also paying for routine operation and maintenance. They petitioned the government to take over management on the grounds that they had the right to own the systems because, after 20 years, they had repaid their required cost of construction. Farmer leaders asserted that they could manage the systems more efficiently by themselves and could keep the costs down in the future.

This study[1] describes the transfer process in Coello and Saldaña and examines its effects on management performance. Key questions addressed are:

1) Did the transfer achieve viable local management? and
2) How did management transfer effect the performance of the irrigation system, especially for cost-efficiency and financial sustainability?

This case was selected in part to examine the conditions which motivated farmers to take over management It also provides an interesting contrast to situations common in Asia where the legal status of farmer organizations is weak and where considerable emphasis is placed on

motivating, organizing and training farmers to take over irrigation management (Korten and Siy, 1988). In Colombia, the transfer was primarily a process of negotiating the terms of transfer and making changes in the users association, management staff and the accountability of staff to the association.

Irrigated Agriculture in Colombia

Colombia is located in the northwest comer of South America at a latitude of 5^0 North. It is a mountainous country with an area of 1.1 million sq km and a population of 31.8 million people. The country has relatively abundant water resources including more than 1,000 perennial rivers. It has both tropical and temperate climates and an average rainfall of 1,500 mm/year. A marked bi-modal distribution in April/May and October/November makes the need for irrigation primarily supplemental (Garces & Vermillion, 1994).[2]

Of 6.6 million ha of potentially irrigable land in Colombia, only 11.4 percent or 750,473 ha has already been developed, consisting of 525,869 ha under irrigation and 224,604 ha under drainage and/or flood protection facilities (Sandoval, 1990).

At present, 155,454 ha of land are irrigated by the public sector, under the supervision of HIMAT[3], and 370,415 ha are under private sector or farmer management. The private sector has played a major role in the development of irrigated agriculture in the country, representing 70% of the present total irrigated area (Garces, 1992).

Irrigated agriculture in Colombia includes a wide range of technologies. Under private sector enterprises all types of pressurized irrigation are available: self-propelled devices, sprinklers, micro-jets, buried pipes, etc. Most public irrigation systems are gravity-flow schemes although there are some pressurized pump systems. Under gravity irrigation, it is common to see siphons, furrows and basin irrigation.

The Government of Colombia is currently engaged in an ambitious irrigation subsector development strategy. The government plan has three main and inter-related components: i) a ten-year irrigation expansion program with roughly 500,000 ha as the target; ii) a "mini-districts" program which develops new, small-scale irrigation systems primarily in hilly areas, and iii) an irrigation management transfer program that will eventually turn over management of the 23 large-scale irrigation districts to farmer water users associations (Republica of Colombia, 1991).

IRRIGATED AGRICULTURE IN TOLIMA VALLEY

Physical Context

Coello and Saldaña irrigation districts are located in the Tolima valley in the central part of Colombia (Figure 1). The valley is at an elevation of 380 meters and is surrounded by the Andes mountains. The valley sits between the central and west mountain ranges of the country with the large Magdalena river running through the middle, creating the Magdalena and Tolima valleys.

The Tolima valley has a mostly flat topography with undulating terrain towards both mountain ranges. The valley has primarily alluvial soils, fans, terraces and narrow valleys with minor rivers. Soil erosion is evident as one moves up the hillsides but is not yet a problem in the valley floor. Main soil orders are entisols, inceptisols and vertisols (IGAC, 1987).

Yearly precipitation in the valley is between 1000 and 1500 mm. The median temperature is 27.9°C. Average relative humidity is 74% and the yearly average tank evaporation is 1800 mm.

Agricultural and Socio-economic Context

Agricultural practices in the area can be traced to pre-colonial times when the land was in the hands of the Indian Chief Saldaña. After the Spanish conquest the lands were turned over, by Royal Decree, to Carmelitas Missionaries who tilled the land with the help of the local population. After the establishment of the Republic in 1820 the lands were purchased by a few large landowners who allowed local peasants to work the land in exchange for one-thud of the produce and six weeks of free labor in the main "haciendas". Land near rivers was cultivated, with maize, plantain, cassava, and rice being the main crops. (IICA, 1965).

Increasing social pressures and discontent with exclusive land tenure patterns led to the break up of the original "haciendas" or large farms cultivated by peasants. In the early 1930's, the Government of Colombia reformed the land tenure system and divided up large farms and sold plots of between one and 10 ha in size to former land renters and laborers (IICA, 1965).

In 1943, after many years of feasibility studies and growing social unrest, the then Ministry of Economics undertook a final study (McCausland, 1945) which led to the construction of the Coello-Saldaña Irrigation District under the direction of Caja Agraria, a semi-independent lending and development agency. The report recommended an irrigation district needing 13 m^3/s from the Coello River to serve 20,000 ha. It would include about 2,500 owner cultivators with an average farm size of 6.6 ha. The cost of the project was estimated at 5.7 million pesos in 1943, which included capital cost, purchase of land, interest, construction and contingencies which amounted to Ps 287 per ha (McCausland, 1945).

The introduction of irrigation to the area transformed the agriculture of the valley. Cotton became an important crop during the early period of the irrigation district in the 1950s and 1960s. It was eventually replaced by rice which became the main irrigated crop by the 1970's and remains so today. Maize, sorghum, fruit and vegetables are also now irrigated in the valley.

Remaining haciendas changed to agricultural enterprises and became production oriented. With the enhancement of work opportunities and, hence, better social well-being of small holders or landless farmers, relationships between large and small land owners improved. Training programs on farm management, credit, developing cooperatives, and so on allowed small growers to increase their incomes (I&H Ltda, 1985). Today, Tolima valley is an important farming area and is a relatively prosperous part of the country. Given its central location and major roads which pass through Tolima, it has a comparative advantage in food distribution. This has resulted in the

development of numerous towns where. agriculture and agro-business constitute the mainstream of the local economy. These include farm machinery and spare parts dealers and repair shops, hardware and agricultural inputs stores and spraying companies. The Caja Agraria and Banco Ganadero (a private credit and development bank) are important agricultural credit institutions which have been available to small and large holders in the valley for more than 20 years.

Also present in the area are a large number of both public and private organizations which provide technical assistance and/or agricultural support services to farmer managed irrigation systems.[4]

DEVELOPMENT OF COELLO AND SALDAÑA DISTRICTS

Construction began in 1945 and was completed by 1953, when the district became operational. Coello and Saldaiia Districts were initially constructed and managed as a single district. They were separated in 1976 when the management was transferred from the government agency to the water users associations.

Coello Irrigation District is a river diversion system by means of a lateral intake with a design capacity of 28 cubic meters per second (m^3/s). The intake consists of an approach channel formed by an earthen levee, which facilitates flow intake during low river levels in the dry season. The intake has two radial gates with provision for both sediment intake and water depth control (HIMAT, 1991a). The intake channel leads to the main conveyance canal (Gualanday) which has a capacity of 25 m^3/s and extends for 5.7 km before reaching the command area. The main canal divides into four branch canals at this point: Serrezuela, Jaramillo, Tolima and Espinal. Each branch canal leads to secondary and tertiary canals, all of which are unlined.

The district covers an irrigated area of approximately 25,600 ha, making it one of the largest schemes in the country. The district was not designed with a parallel drainage system, which has resulted in waterlogging and salinity problems on as much as 7,000 h a It has 1,347 water users with 1,826 holdings. Average farm size is 14 ha. (See Table 1 for additional basic data.) 26.6% of farms are five ha. or less in size; 14.4% exceed 50 ha in size (Table 2).

The Saldaña Irrigation System is also a river diversion scheme, south of Coello District, diverting water from the Saldaiia River. Saldaiia has a direct intake without an approach levee. The intake structure also has radial gates and water head controls. It has a design capacity of 30 m^3/s which leads to the main conveyance canal (Canal Ospina Perez). This canal runs parallel to the Saldaiia River for 13 km and has three off-take branch channels: Animas, Norte and Sur. In turn, each branch leads to sub-systems of secondary and tertiary canals, all unlined (HIMAT, 1991b).

Saldaiia district covers an irrigated area of approximately 14,000 ha. The lack of a complementary drainage system has resulted in waterlogging of up to 1600 ha in the Rio Chene area. With 1,500 water users having 1,850 holdings the average farm size is 7.5 ha. (Table 1) 56.4% of the farms in Saldaiia are five ha. or less in size: only 5.1% exceed 50 ha. in size (Table 2).

Prior to the transfer, and under die administrations of the districts by Caja Agraria from 1953 to 1968 and Incora (the government land reform agency) from 1968 to 1976, selected rehabilitation took place in both the Coello and Saldaiia. In Coello between 1968 and 1973 more than 2,895.67 million pesos (Ps), in 1988 constant pesos, were invested in rehabilitation. In Saldaña, between 1969 and 1972 more than Ps. 760 million were. spent on irrigation and drainage works (Table 3). Due to recent rehabilitations, by 1976, at the time of the transfer, rehabilitation was not an important issue in negotiations between HIMAT and the farmers about the terms of management transfer and hence, no rehabilitation was done in either system in connection with the transfer.

However, the issue of financing rehabilitation was always a matter of concern for both die government and the emerging user-managed districts. Who should pay for rehabilitation works after the systems were turned over to the users associations has been an issue which has yet to be settled and which has increased in concern now that the transfer process is being extended by the government to all irrigation districts in the country. In the case of Coello and Saldaña, the users argued that since the government had not turned over the infrastructure and had instead "delegated" the system, it was the responsibility of the government to maintain the works which belonged to the nation. This argument, however, ran counter to their earlier argument that since they had already paid for the construction of the system they should own i t Despite pressure from the government farmers refused to pay or repay any of the cost of rehabilitation in either system.

MANAGEMENT TRANSFER IN THE TWO DISTRICTS

Transfer Process and Agreement

In the early 1960s the Government of Colombia entrusted the operation and maintenance of its irrigation districts to INCORA, a government land-reform agency. The performance of the agency in irrigation management was modest at best. Water users of the Coello-Saldaiia District were not only unhappy with the poor O&M service provided but were also concerned about the high management costs. In the early stages of development in the 1950s more than 90% of the farmers paid the water fee, but this percentage declined over time due to fanners' dissatisfaction with the quality of management. Declining fee collections further hindered the ability of the agency to provide effective irrigation service. Inefficient operation and maintenance of the system further motivated fanners to request management be transferred to them.

As a result the farmers, who had already formed a water users association, decided at their own initiative in 1975 to make a formal request to the government that management responsibility for the system be transferred to the association of water users. The association argued that the scheme was legally their property on the basis that they had already paid the government their due share for the costs of construction.

As part of a policy to improve the performance of the irrigation districts, in 1976 the government created HIMAT which had an initial task to turn over the management of the Coello-Saldaiia District to two newly-separated water users associations, thus establishing two separate dishicts, Coello and Saldaiia. This was the first case of irrigation management transfer in Colombia.

It set a precedent for other transfers later on.

Negotiations for management transfer were completed within a year, between 1975 and 1976. The associations hued their own lawyer to represent them in negotiating the terms of the transfer. Issues to be resolved were the disposition of existing district staff, ownership status of scheme assets and the future degree of control or involvement of HIMAT in the districts. It was finally agreed that most of the existing staff would be retained by the districts and others would be transferred out. Ownership of assets would remain with the government. HIMAT would retain a role of oversight for district management, to ensure that the systems were properly maintained.

The transfer process employed a legal rule in the country's constitution referred to as "Delegation of Administration," by which a public good (in this case, an imgation district) could be turned over to a private-sector corporate entity (a water users association) for administration on behalf of the state. The users were then empowered to recruit staff and organize and manage operation and maintenance of the two systems with the proviso that it would be financially self-reliant and government subsidies for O&M would be discontinued.

Since responsibility for the districts was only "delegated," ownership of assets remained with the government The government argued that under existing laws it could not relinquish ownership of scheme assets. The delegation of administration created a continuing labor relations conflict between the districts and the government which resulted in numerous legal debates and proceedings until the 1990's. Labor laws prohibited the firing of existing staff previously hired by the government. This problem became widespread when the government started transferring management to farmer districts throughout the country in 1990. Eventually in 1993 a new land development law was enacted with the intent to grant full control to the districts to hire and fire personnel as they wish (Min. of Ag, 1993).

Changes in Management

Before transfer, imgation was scheduled on the basis of pre-season crop plans and water requests which were submitted by duly registered farmers. Fanners had to pay the area-based water fee prior to the season for which water was ordered. District management prepared the irrigation schedule based on the irrigation orders received. Irrigation requests were approved to the extent that predicted water availability met the aggregate demand. The user was responsible to go to the district office before the season to sign an agreement with the seasonal irrigation plan. The user was informed of the day and time of his or her irrigations and the ditchtender made an inspection of the farm to make sure that the canals, turnout and measuring devise (if any) were in working condition. The ditchtender was responsible for delivering water to farm turnouts according to the agreed schedule and for recording the total water delivered for the season. The volumemc fee was paid after the season and had to be paid before any irrigation orders could be approved for the next cropping period.

Prior to transfer the agency was responsible for preparing annual plans for maintenance and repairs, Such plans were prepared by the head of the maintenance unit based on field inspection and

occasionally from users feedback or complaints. The most common maintenance works were desilting and cleaning of canals, road maintenance and structural repairs. Targets were established in advance but deviations were common due to funding constraints for repair or operation of heavy equipment.

District management had administrative and operational manuals detailing roles and responsibilities of staff and users. These included guides for applying sanctions for non-compliance with rules. Data on daily rainfall, temperature and relative humidity are available since project inception to the present. Data on river, main and branch canal flows were also recorded daily but *are* no longer available for certain years. Records of seasonal crop and irrigation plans, fee collection levels, register of farmers, inventory of equipment and supplies, accounting, and yearly budgets were kept regularly. However, information management and record-keeping reportedly declined by the mid 1970s (Incora, 1974).

After transfer HIMAT retained a partial supervisory role for O&M plans, irrigation scheduling, fee collection and budgeting. It provided technical guidance to the new district boards and management *Also,* under the transfer agreement most former agency employees remained with the districts. Hence, there was little change in routine operational rules and procedures, at least in the first few years after transfer.

Gradually, after transfer, the new district administrations started introducing innovations and hying to become more efficient. Attention was given to reducing staff where possible and revising cropping patterns. In Coello, where water supplies were insufficient for planting rice over the entire system, a rice rotation and zoning plan was introduced to enable all farmers to plant rice at least once per year. In Saldaiia a continuous, staggered rice planting arrangement was introduced which allowed 2,000 ha of rice to be planted every month. This improved the water distribution and reportedly improved farmers' profit margins somewhat by spreading rice marketing throughout the year.

After the transfer in 1976, the users associations for Coello and Saldaiia Districts elected boards of directors to supervise their respective districts. Each board had, and still has, seven members with fixed quotas for two categories of farmers--four members having **farm** *sizes* less than 20 ha and three with farm sizes of more than **20** ha. After transfer each board recruited general managers who were engineers. The districts then became responsible for day-to-day operation and maintenance of the system. This included setting and collecting water fees, hiring and firing their own personnel and planning yearly budgets. In practice though, **HIMAT** retained considerable influence over the management of the districts. This included providing advice and consent over O&M budgets and work plans, water fee levels and staff disposition. The agency also retained direct management of the diversion weirs and main conveyance canals for both systems.

One of the more noticeable results of the transfer was the significant reduction of personnel. Before transfer, in 1975, the two districts combined had a total of 300 employees. **As** can be seen in Table 4, the total staff for both districts was 189 by 1993, which was a 37% reduction since transfer. Accounting for changes in area irrigated, in 1975 there were 62.3 ha of service area per

district staff. By 1993 this had risen to 147 ha per staff. The number of administrative staff remained the same, at 36. Most reductions were made in maintenance and technical support staff. Staff reductions were gradual and occurred mostly through attrition and non-replacements after retirements. This was because of a law making it difficult for managers to fire government employees.

The reduction in personnel allowed management to streamline the organizational structure by combining sections and integrating functions. The general manager, who is responsible to the association Board, supervises an administrative unit and three technical units—operations, maintenance and technical services. The Technical Unit was initially merged with Operations after transfer, but was later restored as an independent unit responsible for water measurement, estimation of water supplies and a meteorological station. The operations unit is further divided according to zones and sub-sections of the system (Chart 1). District board members and agency officials agree that paper work has diminished and administration has become more efficient after transfer, mostly for irrigation scheduling, fee processing and for communications between users and district management.

Organizational Viability of the Districts

Farmers in both districts elect a board of directors of seven members and vote on them every two years in a general assembly. In Saldaña about 446 farmers (roughly 20%) participated in the meeting on July 13, 1976 in which the vote was taken for accepting the transfer agreement. Thereafter farmer participation in general assemblies held every two years was roughly 12to 16% of the membership, varying between 201 and 295 farmers attending and voting in the meetings through 1992 (Table 5). There is no downward bend in participation. It is apparent from interviews with farmers that more disputes and tensions between farmers exist in Saldafia than in Coello. Because of the larger number of small farmers in Saldaña, there is an average of only seven ha per farmer, compared with 14 ha per farmer in Coello. This apparently complicates organizational sustainability in Saldaña, as was reflected in interviews with farmers.

The board recruits and selects the general manager and participates with the general manager in the selection and firing of other district staff. Since all district staff are accountable to the board, some improvement in accountability to farmers' interests has been reported by farmers and district managers interviewed. However, some farmers interviewed reported that field operations staff are still sometimes improperly influenced in the distribution of water by influential farmers and board members.

The policy of partial farmer repayment of construction costs and enforced payment of seasonal water fees engendered in the farmers enough of a sense of ownership in their systems that they lobbied the government to take over management and obtain real ownership of system assets. The fact that most farmers were paying water fees to cover the main share of O&M costs prior to turnover created a more motivating condition for the farmers to take over management. This is because of the expectation that they could not only improve management but could also contain or perhaps reduce the cost of irrigation.

The half-way response of the government of "delegation of authority" only partially satisfied the farmers' interest in obtaining full local control for system management. In practice it became apparent to farmers that more *responsibility* than ***authority*** was transferred to the districts. Although farmers had wanted HIMAT to play more of an advisory role, the government retained more of a supervisory role over district budgets and O&M plans. **After** transfer the districts were unable to cut staff and costs as much as they wanted. However, it is apparent that many farmers want the agency to continue to provide technical and financial support services. Several farmers interviewed stated the need for HIMAT to act as an auditor and mediator to help legitimize the farmer organization and settle disputes.

The failure to transfer ownership of system assets to the associations, combined with an expectation that the government would make future repairs and replacements, left farmers without a reason to raise a capital replacement fund. Such a fund probably would have considerably strengthened the organizational and financial sustainability of farmer associations.

Perspectives **About the** Transfer

The initiative for transfer came from the water users rather than the government. Farmers assessed the implications of transfer and gave their collective approval in general assembly meetings. By the time of transfer farmers were already financing most of the cost of O&M and had the expectation that they would be able to keep the irrigation fees from rising or even reduce them.

Farmers interviewed for this study had the following main positive perceptions about the transfer:

1) it helped keep irrigation costs down,
2) it improved accountability of staff to the farmers,
3) it improved the timeliness and responsiveness of management decisions and
4) it led to a decrease in political appointments for staff positions.

Interviews with board members in both Coello and Saldaña showed they placed high priority on cost reduction. Interviews with farmers also revealed the widespread perception that water distribution performance, structural maintenance and cost efficiency could have been much more improved had the users had full control over staff disposition and budgets prior to the 1993 Land Development Law.

Some farmers expressed the view that by taking over the administration of the systems they were providing a service to the nation by diminishing social unrest related to water problems and that therefore the government had some obligation to compensate the association for that service.

District managers expressed concern that the strong farmer disposition toward cost reduction was resulting in some decline **in** service. Senior experienced personnel have been replaced by younger, inexperienced staff; key technical positions have been eliminated or merged and little or no expenditure is being made in training or replacement of equipment or structures.

HIMAT staff at the district and higher levels were generally resistant to the transfer at first. They had the perception that jobs would be lost and the role of the agency would diminish in irrigation management, not only in Coello and Saldaiia but eventually elsewhere as well. However, negotiations and some political contacts made by farmers eventually resulted in the transfer decision.

Later it became apparent to fanners that HIMAT's role in the districts was more than just "oversight" Many farmers saw it as restricting their ability to further reduce staff and budgets, as the associations had wanted. Farmers perceived the transfer as being only partial and not enough to give them full control. However, 15 of 18 farmers interviewed in Coello stated that HIMAT (now "INAT") should continue to be involved in assisting the districts, especially in subsidizing the cost of irrigation, providing technical guidance and conducting financial audits and oversight. Sample **farmers** in Saldaiia tended to see HIMAT as more the problem than the solution. Nineteen of the 25 farmers in the Saldaiia sample stated that HIMAT should withdraw completely from involvement with the district; only **four** suggested HIMAT should continue its involvement.

Of 20 sample farmers in Coello, 16 said that management transfer had not changed the overall management performance of the districts, four said it had improved and none said it had worsened In Saldaiia the picture was less positive. Eleven of 25 sample farmers said management performance had worsened after the transfer, nine said it had not changed and five said it had improved. However, it is a widespread view among users that while problems remain, bureaucracy and corruption have diminished.

EFFECTS OF MANAGEMENT TRANSFER ON PERFORMANCE

The government's interest in the transfer was initially to accede to political pressures and later to reduce government subsidies to the irrigation sector through a national policy of management transfer. In Coello and Saldaiia the government was successful in discontinuing its subsidies for O&M, however it continues to fully finance rehabilitation. If farmers feel they can defer maintenance costs so that the government will finance future rehabilitations, the government may not conserve as much money in the irrigation sector as it would like.

As stated by farmers and association board members, their performance objectives of the transfer have been to be **as** cost efficient **as** possible while not sacrificing the agricultural productivity, irrigation performance, financial viability and physical sustainability of the districts. We assess performance of the districts according to these criteria below.

Agricultural Productivity

The gradual expansion ***of*** irrigated area after construction halted for about four years at the time of transfer, perhaps because of uncertainties and inefficiencies temporarily created by the change in management. But the expansion resumed after this apparent learning period and only began levelling off in the early 1990's (Figure 2). The rate of expansion has been higher in Coello than Saldaiia.

Largely as a result of the introduction of green revolution varieties in the 1960s and 1970's, average rice yields increased dramatically from approximately 2,500 kgs in the mid 1950s to approximately 6,000 kgs in 1976, at the time of transfer. By the 1990s average rice yields were between 6,500 and 7,000 kgs per ha. Most of the increase in yields occurred before transfer, but high yield levels were sustained after turnover through the early 1990's, with a slightly increasing trend (Figure 3).

Irrigation Management

There is no indication that the operation or maintenance of the system improved or deteriorated dramatically as a result of the transfer. Water continues to be delivered without being measured below main canal offtakes. Comparison of data from 1982 to 1993 on the annual volume of water diverted at the headworks with the aggregate amount of water delivered to all tertiary canals, provides a measure of what is termed herein as "total conveyance efficiency" (Figure 4). Annual measures of total conveyance efficiency for this period ranged between 32% and 78% in Saldaña and between 60% and 78% in Coello.[5] The average was 60% in Saldaña and 69% in Coello.

A field check was made on July 15, 1993 comparing actual and target discharges into farm outlets along a tertiary canal located at the Florencia Secondary Canal in Saldaña District. The ratio between actual and target discharges is termed the Delivery Performance Ratio, or DPR. From the first outlet at the headend to the 18th outlet at the tail, the DPR exhibited a clear downward trend from head to tail, ranging from 260% at the head to 75% at the tail (Figure 5). One such test can not verify a pattern but it does suggest a distribution problem may exist in Saldaña. Unfortunately, the lack of measurement devices and limited resources for this study did not permit further measurement of irrigation performance.

Farmers interviewed in both districts were equally divided between those who feel the amount of water delivered to their fields is in accordance with what they were supposed to receive. Several smallholder farmers interviewed noted that some influential larger farmers, including association board members, tend to intervene in day-today management and give orders directly to ditch riders or other field staff, sometimes for partisan purposes. In Coello 25% of sample farmers said they were aware of unfair or unofficially excessive water deliveries occurring, while in Saldaña half of sample farmers reported unfair or unofficial water deliveries. Farmers in both districts identified the primary beneficiaries of maldistribution of water as large landowners, not headenders.

Sample farmers in both districts were asked what were the three most important constraints to higher yields and higher profits on their farms. Of 112 total responses only 14% identified water supply or drainage problems as key constraints to higher yields (as opposed to other problems such as inputs, soils, pests, etc.). The most commonly-mentioned constraints to profits were low crop prices and high costs of fertilizer and pesticides. Only 25% of the responses identified the high cost of water as a key constraint to higher profits.

Financial Viability

After transfer, the farmers' irrigation policy was essentially to improve cost efficiency while achieving a more responsive irrigation service. This was only partially successful.

The Coello and Saldaiia districts have both a fixed area-based water fee and a volumetric water fee. The emphasis by farmers after transfer on cost efficiency resulted in a decline in the area fee since transfer. However the volumetric water fee rose after transfer in real terms (1988 pesos). In Coello the area fee has dropped from about Ps 3,000 per ha in 1976 (at transfer) to Ps 1,850 per ha in 1993 (in 1988 pesos; see Figure 6), while the volumemc fee rose from about Ps **0.42** per cubic meters (m3) in 1976 to Ps 0.54 per m3 in 1992 (in constant 1988 pesos; see Figure 7). In Saldatia both area and volumetric fees are higher than in Coello. In Saldatia the ma-based fee dropped only slightly after transfer, from Ps 3,000 per ha at transfer to Ps 2,650 per ha in 1993. The volumetric fee rose from Ps 0.42 at transfer to Ps 0.63 per m^3 in 1993. The difference in the cost of water between Coello and Saldaña may be due to the fact that in Saldaña farmers only plant rice, which has much higher demands for water than for the mixed cropping in Coello. **Also** Saldaiia has a serious problem of siltation in the intake canal and continuously employs costly floating drag lines on boats to desilt the canal year round.

When we combine the *area* and volumemc fee data on an annual basis we find that the total annual cost of water per ha rose 16.9% from the mid 1950s to the period 1989-92 (from 8,620 to 10,080 pesos, in constant 1988 pesos; Table 6). However, the cost of production for the main irrigated crop (rice) rose 116% during this period. Therefore the cost of water relative to the cost of rice production fell from 4.4% to 2.4% between these periods.

Data on Coello indicates that the farmer districts were fiscally responsible in the sense that expenditures never exceeded revenues after transfer occurred. Figure 8 shows the changing patterns in levels of revenue and expenditures before **and** after management transfer in Coello District. During the initial stages of scheme development, expenditures exceeded revenues, partially because of external subsidies and development assistance. The early drop in revenue and expenditures was due to the transition from scheme development to scheme management. Except for 1984, between 1983 and 1992, in Coello district revenues always exceeded expenditure levels, with both showing a **modest** increasing trend (Table 7). **Coello** District revenues increased from **Ps.** 10,184 **per** ha at transfer to **Ps.** 13,315 **per** ha in 1992, a real increase of 31% over 16 years (Figure 8). "Sideline" revenue sources--such as rental of farm equipment and district property, technical services, fines against members, sale of materials and charges for transporting equipment and materials--increased from about 10% to 20% of revenue between 1983 and 1992 (Figure 9).

Saldaiia District had a much weaker financial position, with expenditures exceeding revenues for six out of the ten years between 1983 and 1992. The level of revenue per ha in Saldatia fluctuated widely after turnover but began at Ps. 10,775 per ha in 1977 and was at almost the same level in real terms in 1992 (Figure 10). Main sources of revenue for both districts were *the* volumetric and area water *fees.*

Maintenance costs (including relevant staff costs) account for about 55% of total expenditures in Coello District. This is followed by costs of administration and operations. The proportion of each to total costs remained roughly the same after transfer.

Physical Sustainability

In both districts between 60% and 70% of all district income goes towards maintenance of the irrigation network. This percentage did not change significantly after transfer, since O&M budgets continued to be based on previous years and continued to be reviewed and approved by the agency. However, district managers reported concern that the strong farmer emphasis on cost reduction was compromising the physical sustainability of the systems.

Farmers are divided in their views as to whether the system is deteriorating. A majority of sample farmers in Coello reported no deterioration over the past ten years. However. eleven of 25 farmers in Saldaiia felt that the system had deteriorated over the last ten years. The more positive perception in Coello may be due to the rehabilitation in Coello during the 1980s (see below). Since the government still claims ownership of system structures, farmers are unwilling to raise a capital replacement fund, although they do have a replacement fund for equipment.

In 1984 HIMAT, in agreement with the users, conducted feasibility studies on rehabilitation and system expansion in both Coello and Saldaña. Some portions of the canal and road network had deteriorated and were in need of repair. It was necessary to provide attention to some areas with emerging soil salinity and drainage problems. In the case of Coello the study included the expansion of area under imgation by 30,000 ha by diverting water from the nearby Cucuana river. The rehabilitation is currently underway, with a total cost of Ps 9,750 million in 1984. Under the agreement new irrigators pay 90% of the cost via special taxes. In the case of Saldaña an expansion of 3,800 ha in the south side of the district and the improvement of natural drains is planned. A cost of Ps 1,480 million was attached to this work which until now has only been partially implemented. Farmers refused to repay the cost for this rehabilitation.[6] This shows that the transfer did not result in a withdrawal of the government from taking responsibility for ensuring the long-term sustainability of the systems, even to the extent of fully financing the costs if need be. Whether this level of commitment by the government can be sustained and whether and when farmers will take on responsibility for system rehabilitation remains to be seen.

GENERAL LESSONS AND ISSUES

Transfer achieved the government's objective of discontinuing subsidies and making the districts financially self-reliant for operations and maintenance.

It is apparent that the transfer did not inhibit long-term expansion of the area irrigated or the ability of irrigated agriculture to sustain high levels of rice yields. Despite rising costs of agricultural production and a decline in crop prices, yields and area irrigated remained fairly stable after the transfer. It appears not to have had a substantial impact on irrigation performance.

The districts have been only partially successful in achieving greater cost efficiency. Staff levels have been reduced 35% since transfer and area-based water fees have declined in real terms. However volumetric fee rates have risen much faster than the general rate of inflation. While Coello District was able to establish a stable favorable financial position after transfer, Saldaiia has had continuing problems balancing its budget.

Farmers are much less satisfied with the irrigation service in Saldaiia than in Coello, indicating concerns about water distribution, system deterioration and the continuing involvement of HIMAT. This may be partly due to the larger numbers of small holders in Saldaiia, more tensions between farmers in the district and less willingness of farmers to finance irrigation adequately.

In 1990 the Government of Colombia embarked on a program to transfer full management responsibility to all irrigation districts in the country. The new Land Development Law of 1993 is intended to ensure that a proper balance of authority and responsibility for irrigation management is transferred to the water users. We hypothesize that a more complete transfer of management authority will lead to a more favorable and locally-sustainable result in Coello and Saldaiia and in other irrigation systems in Colombia. The following lessons of international relevance for irrigation management transfer are supported by this study.

Supporting Conditions

This study supports the view that it is more effective to create motivating conditions for farmers to take over management than it is to try to motivate and organize farmers in the absence of such conditions. Where such conditions exist, the transfer process becomes more a matter of negotiation than externally induced organizing. Key motivating conditions in Coello and Saldaiia included:

1) an uncontested water right at the source;
2) legal and political recognition of the users' associations (which is now strengthened further by the new water law);
3) fanner investment in the systems prior to turnover, with repayment of construction costs supporting a sense of ownership in the system;
4) prior to turnover farmer payment of an imgation fee which was based on the actual system-level cost of management (thus revealing to farmers the real cost of management by the government);
5) farmer dissatisfaction with the irrigation service prior to turnover, and
6) farmer expectations that they could improve responsiveness of management and cost efficiency.

The profitability of irrigated agriculture and the relative value of water are key factors which determine farmers' capacity and willingness to take over management of irrigation systems. The prospects for successful transfer are probably greater where the value of water for fanner livelihoods is most pronounced. While the cost of water relative to total production is still small in this case in

Colombia, declining profit margins for irrigated agriculture could constitute a future threat to the financial viability of farmer managed irrigation. Under such circumstances, raising secondary sources of revenue constitute the replacement of public subsidies with private sector ones.

The managing agency will often be resistant to a transfer policy because it may represent a threat to its budgets, staff and influence. Hence, if a transfer policy is to be implemented effectively, it is essential to have strong political support for it. In this case, fanners lobbied with high-level politicians and obtained approval to take over management.

Transfer Arrangements

Farmer organizations need full control over raising and spending revenues, hiring and firing of staff, applying sanctions, and entering into contractual relationships. The "delegation of authority" to the users association left fanners in Coello and Saldaña with the sense of incomplete control over budgets and staffing for many years. This inhibited cost efficiency and accountability of management to farmers. HIMAT continued to supervise district budgets and restrict staff cuts. The government continued to own the infrastructure. Farmers are divided between the two districts over whether or not HIMAT should continue to be involved with them, but they share a desire to take over ownership of the infrastructure.

The government of Colombia has not had a clear policy of the terms and conditions for financing rehabilitation. Hence, farmers in the two districts have not had an incentive to raise a capital replacement fund to pay future costs of rehabilitation or system improvement. They have refused to pay for rehabilitation until the present.

Prior to declaration of a transfer policy, the government and farmers should clarify who will be responsible for financing and implementing future system rehabilitation and improvements and what terms and conditions will apply to each party. This will help prevent a tendency toward deferred maintenance and encourage farmers to raise a capital replacement fund.

Transfer **Process**

Enactment and implementation of transfer policies should be preceded by comprehensive and participatory strategic planning which includes clear definition of future agency roles after transfer. This can also help reduce resistance to transfer by the agency, especially if new positive roles for the agency are identified to replace its prior role in system-level management (IMPSA, 1992; Vermillion, 1989). Such future roles could be allocation of water along river basins and environmental monitoring and regulation.

This case suggests that specific terms and conditions of transfer must be negotiated locally between the government and farmers. Relatively little emphasis on training and organizing farmers may he needed where farmers are already organized on the basis of construction repayment agreements and where skilled third party management staff are available to manage the systems directly under the supervision of elected farmer representatives.

Post-transfer **Support** for **Local** Management

Farmers may not want total and abrupt withdrawal of government agencies after transfer. How total and how abrupt the withdrawal should be depends largely on how prepared farmers are to take over management. Negotiations between farmer representatives and agencies can define a new partner relationship.

This study and others (Svendsen & Vermillion, 1994) indicate that the strong farmer interest in cost reduction after transfer has a risk of sacrificing the physical sustainability of imgation systems. There. may be a weakness in farmers' ability to make an appropriate trade-off between cost efficiency and long-term investment. Clarity about future responsibility and the use of technical audits by external parties may be helpful in this regard. Governments may find it useful to link conditions for future assistance to performance assessments of maintenance, which can be done through technical audits.

In Coello and especially Saldaña, tensions between large and small landholders over water distribution, fee levels and other district policy questions constitute a threat to the organizational viability of the districts. Several farmers expressed the desire for HIMAT, Fedemegos (the National Federation of Irrigation Districts) **or** other government agencies to monitor and mediate internal problems the districts experience. Local factional differences in rural populations, lack of effective accounting practices or skills and disputes over water distribution can weaken the ability of farmer organizations to provide effective and equitable irrigation services. External support from government agencies or farmer-based federated organizations may be helpful to ensure sustainability of locally managed irrigation and its adaptability to changing opportunities in their external environment. Hence sustainability of imgation systems appears to depend not on total local self-reliance but on a new mixture of local resources and modest external support.

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ANNEX 1

REPUBLIC **OF** COLOMBIA
BASIC INFORMATION

Location:	Northwest comer of South America
Area:	1'138,355 Km^2 (439,735 sq. miles)
Population:	31.9 million (1992 Census)
Population growth:	2 % per annum
Population density:	28 persons/Km^2 (or 73 persons/sq. mile)
Life Expectancy:	65 years
GNP:	US $41,337 million dollars (1993)
Annual GNP growth:	5.4 % (1992)
GNP per capita:	US $ 1,340
GNP distribution:	Agriculture 21%; Industry 30 %; Services 49 %.
Language:	Spanish
Currency:	Colombian peso; 1 US $ = 825 Col Ps (Sept 1994)
Natural resources:	Petroleum, Natural Gas, Coal, Iron Ore, Gold, Emeralds, Copper, Silver
Agricultue:	Coffee, Bananas, Flowers, Sugarcane, Cotton, Rice, Cattle, Sheep

Table 1. Basic information on Coello and Saldaña Irrigation Districts

DISTRICTS	COELLO	SALDAÑA
PERIOD BUILT	1949 - 1953	1949 - 1953
DATE OF TRANSFER	SEPTEMBER 1976	SEPTEMBER 1976
DESIGN GROSS AREA (ha)	44,100	16,428
IRRIGABLE AREA (ha)	25,628	13,975
NUMBER OF FARMERS (1993)	1826	1965
WATER USERS ASSOCIATION	USOCOELLO	USOSALDAÑA
PREDOMINANT SOIL TYPE	SANDY - LOAM	CLAY AND LOAM
MAIN CROP (s)	RICE, SOYBEAN, COTTON	RICE
WATER SOURCE	COELLO RIVER	SALDAÑA RIVER
SYSTEM TYPE	RUN - OF - RIVER	RUN - OF - RIVER
INTAKE STRUCTURE	LATERAL W/RADIAL GATES	LATERAL W/RADIAL GATES
(km)	252	192
LENGTH MAIN CANAL (km)	100	62
HECTARES PER KM CANAL	101	73
TURNOUT TYPES	SLIDING GATES	SLIDING GATES
NUMBER STRUCTURES	81	69
UNITS OF HEAVY EQUIPMENT	43	35

Table 2. Number of farms by size category in Coello and Saldaña Districts, 1968 and 1993

FARM SIZE CATEGORY	1968				1993			
	COELLO		SALDAÑA		COELLO		SALDAÑA	
	# FARMS	%	# FARMS	%	# FARMS	%	# FARMS	%
0 - 5 ha	264	26.6	589	56.4	703	38.5	1255	63.9
5.1 - 10 ha	200	20.1	146	14.0	386	21.1	279	14.2
10.1 - 20 ha	207	20.8	141	13.5	300	16.4	231	11.7
20.1 - 50 ha	180	18.1	115	11.0	322	17.6	181	9.2
> 50 ha	143	14.4	54	5.1	115	6.4	19	1.0
TOTAL	994	100	1045	100	1826	100	1965	100

Table 3. Rehabillitation expenditures before turnover, Coello and Saldaña Irrigation Districts'

(CONSTANT 1988 MILLION COLOMBIAN PESOS)

	IRRIGATION	DRAINAGE	TOTAL	IRRIGATION	DRAINAGE	TOTAL
1968	155.73		155.73			
1969	564.00		564.00	204.20		204.20
1970	544.58	221.60	766.19	139.33		139.33
1971	410.59	179.65	590.24	285.91		285.91
1972	377.50	147.50	525.00		130.83	130.83
1973	294.51		294.51			
TOTALS	2346.91	548.70	2895.67	629.44	130.83	760.27

• Years with no **values** indicate no rehabilitation **work.**

Table 4. Staff levels before and after transfer

Program	Before Turnover (1975):Coello and Saldana districts	After Turnover (1993)		
		Coello District	Saldana District	Both
Administration	*36*	18	18	36
Maintenance	161	60	50	110
Operation	***51***	19	24	43
Tech/Hydro/Credit	52	0'	0'	0'
Area/staff member (ha)	62.3	151.7	135.9	147.0

Table 5. Farmers attendance in general assemblies

DATE	NUMBER OF PARTICIPANTS
MAY 19, 1976 (TRANSFER PLANNING)	124
JULY 13, 1976 (TRANSFER DECISION)	446
JULY 28, 1978	295
JULY 25, 1980	280
JULY 30. 1982	281
JULY 27, 1984	232
JULY 25,1986	262
AUGUST 26, 1988	280
OCTOBER 26. 1990	259
OCTOBER 30, 1992	201

*Table 6. Cost of water (in 1988 Colombian Pesos), relative to rice production, before and after transfer, Coello District**

Period	Cost of Water/ha	cost of Production/ha	Cost of water/Cost of Production (%)
1953-58	Ps. 8,620	Ps 194,812	4.4 %
1984-87	Ps. 6,698	Ps 334,400	2.0 %
1989-92	Ps. 10,080	Ps 421,200	2.4 %

Table 7. Total revenue and expenditures in constant 1988 Colombian Pesos, Coello and Saldaña Districts, 1983 - 1992.

YEAR	COELLO DISTRICT		SALDAÑA DISTRICT	
	TOTAL REVENUE	TOTAL EXPENDITURE	TOTAL REVENUE	TOTAL EXPENDITURE
1983	252.0	211.1	238.4	221.3
1984	235.0	236.9	233.4	218.3
1985	286.4	220.0	280.7	280.7
1986	284.8	274.9	192.6	217.3
1987	311.9	263.7	218.9	231.7
1988	311.7	264.8	215.5	252.2
1989	351.2	273.8	244.4	245.6
1990	354.0	301.1	236.9	237.5
1991	337.9	315.7	207.9	243.4
1992	361.9	318.1	307.5	241.5

Figure 1. Locations of Coello and Saldaña districts, Colombia

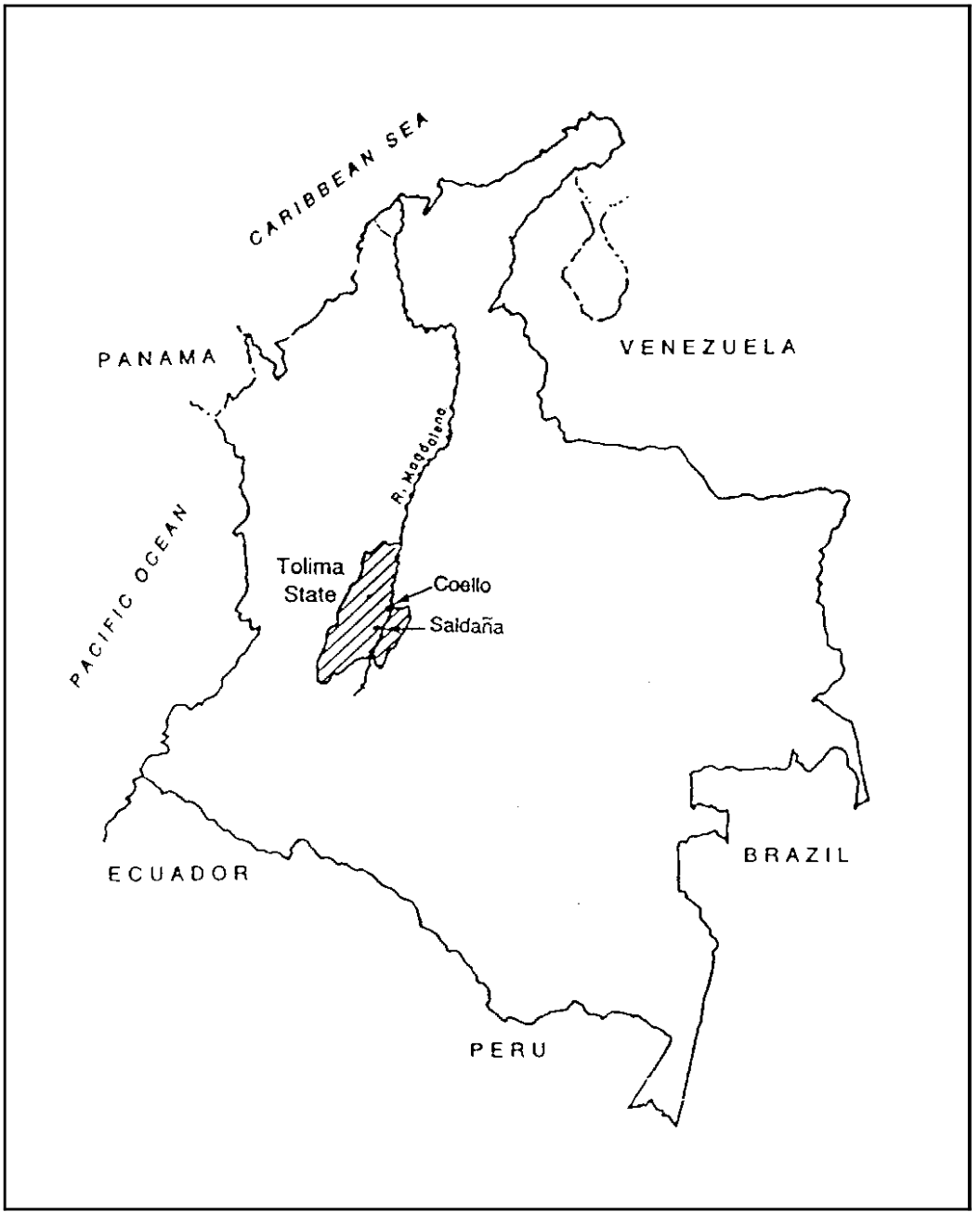


Figure 2. Irrigated areas per year before and afier transfer. Coello and Saldaña Districts, 1953-1993.

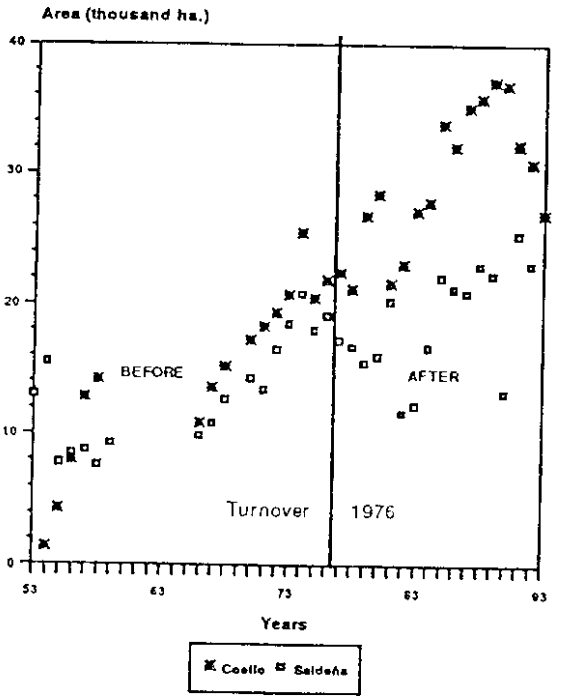


Figure 3. Average rice yields *before and after turnover, Coello and Saldaña* Districts, *1953-1993*

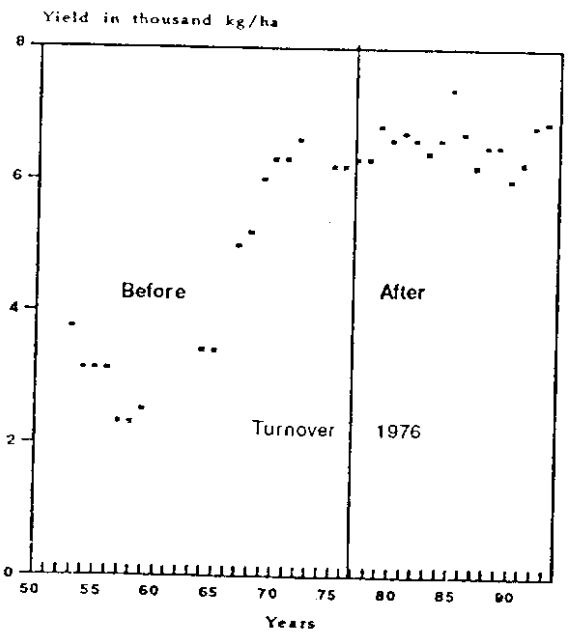


Figure 4. Aggregated conveyance efficiency, 1982-1993, Coello and Saldaña Irrigation Districts

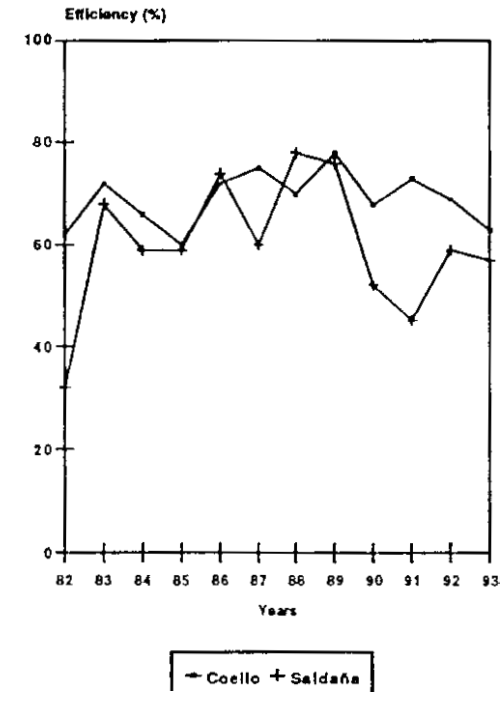
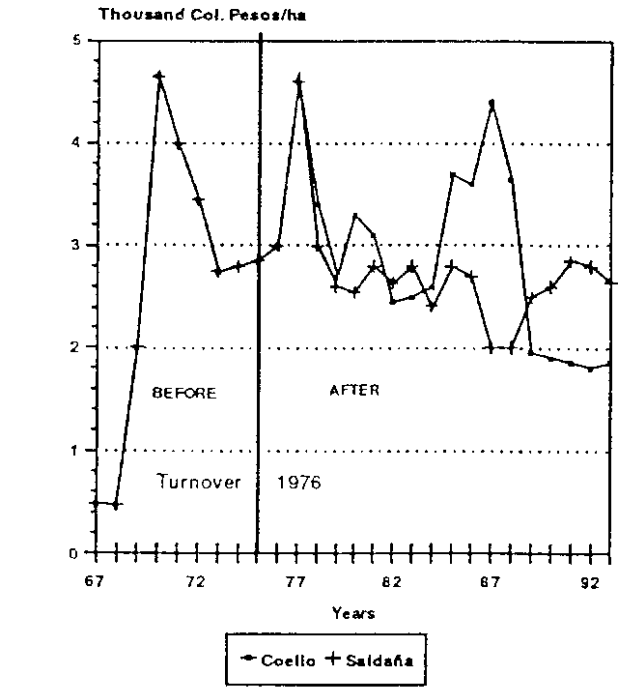


Figure Delivery performance ratio along a tertiary canal: July 15, 1993, Saldana Irrigation District

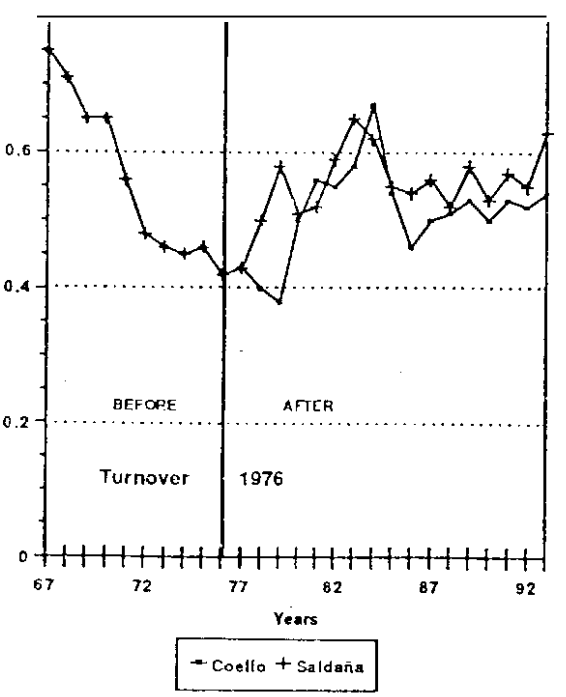
(Outlet number increases with distance from offtake)

Figure 6. Area bused water fee, Coello and Saldaña Districts 1967-1993 **(in** *I988 Colombian Pesos)**



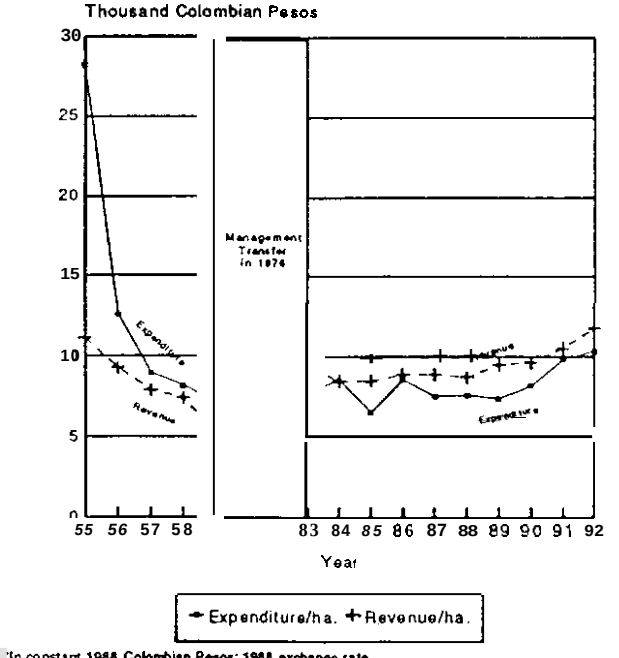
* In 1988, 1 US$ = Col. Ps. 333
In 1994, 1 US$ = Col. Ps. 800

Figure 7. Volumetric water ***fee,*** *Coello and Saldaña districts, 1967-1993 (in 1988 Colombian Pesos)**



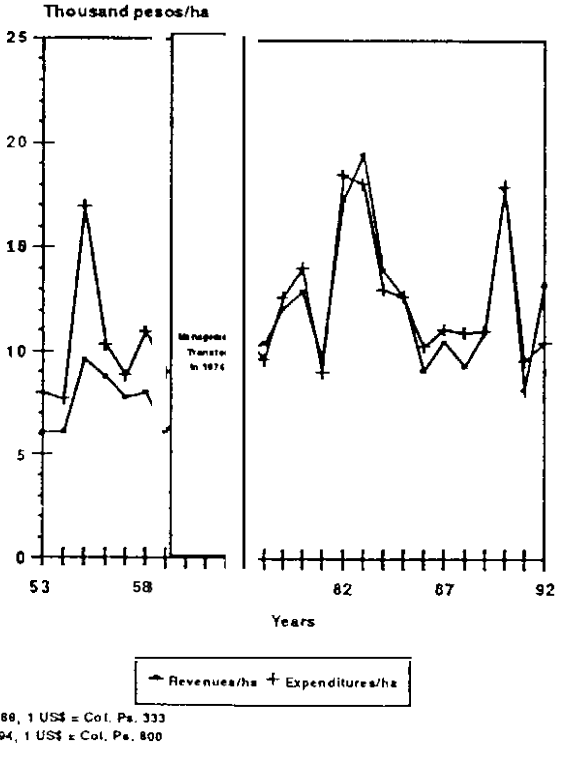
* In 1988, 1 US$ = Col. Ps. 333
In 1994, 1 US$ = Col. Ps. 800

Figure 8. Total expenditure and revenue per hectare, Coello District, 1955-93*



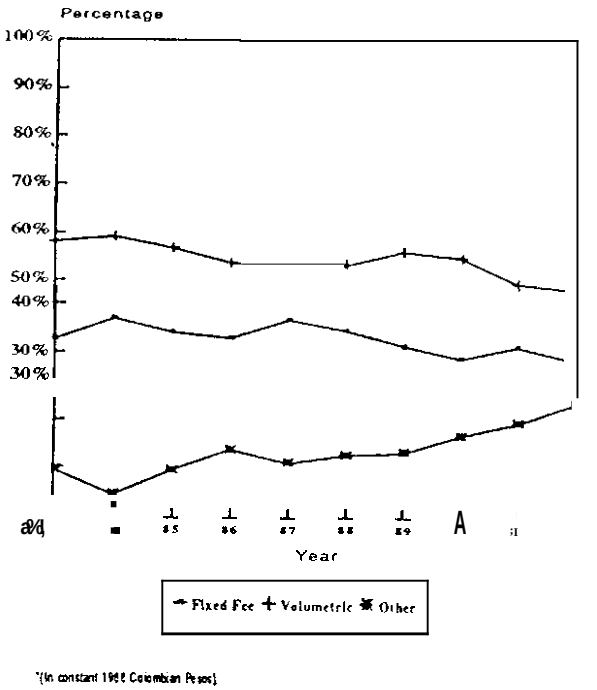
*In constant 1988 Colombian Pesos: 1988 exchange rate was 333 Colombian Pesos per US dollar. In April 1994, exchange rate was 820 Colombian Pesos per US Dollar.

Figure** 9. **Total expenditures and revenues per hectare.** Saldaña **District,** 1953-1992* (in *1988* ***Colombian Pesos)



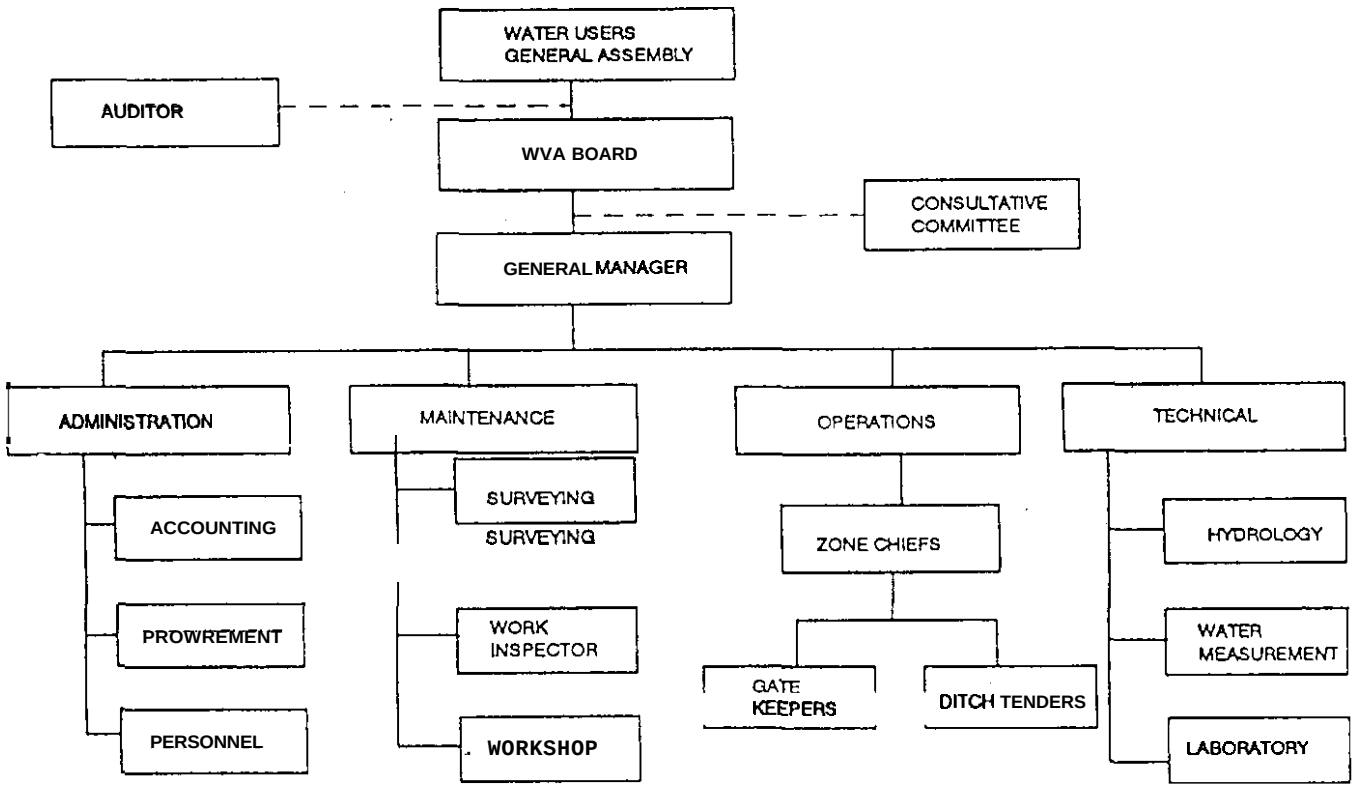
* In 1988, 1 US$ = Col. Ps. 333
In 1994, 1 US$ = Col. Ps. 800

*Figure 10. Revenue sources as percentage of total revenue, Coello District, 1983-1992**



*(In constant 1988 Colombian Pesos)

*Chart I. Coello District organizational structure**



* *This structure is typical of other districts transferred. However, technical units are sometimes included in operations units.*

ENDNOTES

1. This study was carried out in 1993-94. It involved collection of secondary data, group and individual interviews with farmers, district management staff, board members and agency staff and questionnaire-based interviews with **45** randomly-selected fanners, 20 in Coello and 25 in Saldaña.

2. See Annex 1 for additional information on Colombia.

3. In late 1993, HIMAT (Colombian Institute of Hydrology, Meteorology and Land Development) was restructured to help streamline the agricultural sector. Its new name, INAT (National Institute for Land Development). reflects its focus on developing irrigation and drainage systems. It will no longer be involved in hydrology, meteorology, and irrigation management. In Colombia the terms "land development" and "irrigation development" arc synonymous. The concept of land development is defined as:

   ...the construction of infrastructure facilities in order to provide an area wirh irrigation. drainage and/or flood protection wirh the purpose of increasing the productivity of the agricultural and/or animal husbandry sector....

   Irrigation districts arc areas provided with irrigation, drainage and/or flood protection works.

4. Key support organizations for irrigated agriculture are:

   - IDEMA (the governments' agricultural marketing agency),
   - FEDEARROZ (the rice growers federation),
   - FENALCE (federation for other cereals),
   - FEDEALGODON (the cotton growers federation),
   - INCORA (the governments land reform agency),
   - CORPOICA (a semi-public corporation that provides technical and extension services),
   - SENA (the public agricultural training service),
   - CORTOLIMA (regional development agency),
   - INAT (formerly HIMAT)--National Institute for Land Development, the agency responsible for irrigation development and turnover in Colombia, and
   - FEDERRIEGO, (the Federation of Water Users Associations, established in late 1991, to support lo fanner managed irrigation districts; **see** Garcia-Betancourt, forthcoming, and Federriego, 1992).

5. Although **data** was verified for accuracy **of** recording. it appears that the conveyance efficiency figure for Saldaña for 1982 may be in error. It is unlikely to have been this low.

6. Until the present, there is no clear policy about payment for rehabilitation works for systems which will be or have been transferred to the users. The government attempts to negotiate repayment by users on a case by case basis.

3.3 Case Study on Irrigation Management Reform in China

In accordance with the Collaborative Agreement signed between IIMI and the Shijiazhuang Institute of Agricultural Modernization (SIAM) in July 1993, IIMI and SIAM are collaborating on the case study on IMT in China which is entitled, "Changing Patterns of Irrigation Management in North China: Case Studies from Hebei Province." The objective of this study is to assess the nature of changes in irrigation management resulting from the implementation of the production responsibility system and to assess their effects. Special focus is on the impacts of management devolution on irrigation management performance and financial sustainability of irrigation management The increasing importance of the role of the village irrigation management group and sideline enterprises for sustainable irrigation management are examined, following the reforms of the 1980s which led to local financial autonomy for imgation districts.

The Project will take twelve months to implement and includes a six-month intensive data collection phase, which started in July 1993, and a six-month less-intensive analysis phase, beginning approximately in January 1994 and running to the end of June 1994. During the first phase SIAM has undertake to collect the data specified in the agreed Research Work Plan (subject to availability of data). This involves collecting secondary data available in government, irrigation district and village offices; conducting interviews with officials and farmers, preparing maps and charts and processing quantitative data on the computer. SIAM and IIMI will collaborate in production of several jointly-authored papers and publications, either during or after the twelve-month period, as to be mutually agreed. Participants from SIAM in the Research Project include Professor Liu Changming, Wang Xinyuan, Ma Qijun, Zhang Xiying, Xing Xinhai and Mu Haisheng. Participants from IIMI include Sam H. Johnson III, Douglas Vermillion and Mark Svendsen (of IFPRI).

Study sites are located in the Shijiazhuang Prefecture of Hebei Province, which is located on the north China plain. Some basic data on types of irrigation management models and performance is being collected on about 20 irrigation districts in the Prefecture. More intensive time series data and information on management practices is being collected in the Nanyao Irrigation District in Pingshan County and the Bayi Irrigation District located in Yuan Shi County. Both are within a drive of about 45 minutes from Shijiazhuang, which is the capital city of Hebei Province. Shijiazhuang is located about 280 kilometers south of Beijing. By the end of 1993 IIMI and IFPRI staff had made three visits to China (in June, September and October) to provide support and guidance to the researchers in China. Another visit was made by Dr. Svendsen in the first week of January 1994.

A considerable amount of secondary and interview data has been collected which for many variables covers a time span of 20 to 30 years. In the Nanyao and Bayi Districts, time series data has been collected on irrigation discharge and targets at different points in the systems. Data was collected on revenues and expenditures of the districts, agricultural productivity, crop areas and prices and management procedures and practices. Most of the quantitative data has been entered into computer files by SIAM staff. A number of policy and water law documents have been translated into English, The most interesting aspects of irrigation management turnover in the north

China plain appear to be the financial autonomy of the irrigation districts; the distinctive approach towards "cross-subsidization" of irrigation costs through sideline enterprise; and cross-accountability between village, district and bureau organizations for management performance.

The following is a summary of the analysis to dare.

Introduction

With a population exceeding 1.2 billion, China is very concerned about ensuring it can feed its population. In this regard, irrigated land is critically important as 65% of the food grains, 75% of the cash crops and 90% of the vegetables are produced on irrigated land. In addition, irrigation districts supply 70-80% of the drinking water for people and livestock in rural areas (Chen and Ji, 1994).

As one of the oldest societies in the world, irrigation in China has a very long history with documented development of large scale irrigation schemes as far back as 605 B.C. By 1949, China had approximately 16 million ha of irrigated land. After the founding of the People's Republic of China, a major push was made to rehabilitate existing irrigation systems in order to reestablish the system of food production that had been disturbed during the long civil war. From the 1950s to 1970s many new imgation systems were developed. The majority of medium and large systems existing today were developed during this period. As a result of the massive investment, irrigated area expanded rapidly to almost 48 million ha by 1992. This includes 144 large irrigation districts of over 20,000 ha of effective imgation area each covering 7.9 million ha in total. There are 5,198 medium size imgation districts (between 667-20,000 ha) covering 13.3 million ha. Large and medium systems serve about 47% of the total imgated area in the country.

Small reservoirs, ponds, and pumping schemes with an area less than 667 ha are managed by local organizations. Since the 1970s, tubewell technology has been widely distributed to exploit the vast underground water resources that exist in the country (Liu, et al, 1994). Small-scale irrigation accounts for 27% of the irrigated area in China, while other smaller irrigation systems including tubewells are managed by farmers. The area under farmer managed irrigation in China is approximately 26% of the total area (Ministry of Water Resources, 1991).

By the late 1970s; problems associated with China's dramatic irrigation development program were beginning to manifest themselves. As a result of poor management and inadequate maintenance, imgation systems in China were showing signs of structural deterioration and declining productivity. Substandard irrigation construction and ineffective management, combined

with poor national and local economic conditions, held irrigation performance far below actual potential.

During the period of rapid irrigation expansion, from the 1950s to the 1970's, agricultural production and irrigation management were collectivized. The post-Mao reforms introduced by Deng Xiao Ping from the early 1980's introduced a new era of economic liberalization which opened the Chinese economy to the outside world These new policies reduced the dependence of irrigation districts on the government and encouraged local financial and managerial self-reliance. However, at the beginning of the economic reforms, irrigation management agencies found it difficult to adjust to the reforms. As a result, irrigated area in China declined. After ten years of effort, the declining trend in irrigated area was reversed (Chen and Ji, 1994).

Similar to the situation in China, since the mid 1980's there has been a world wide trend to transfer complete or limited authority for irrigation management and financing from government agencies to local organizations, especially cooperatives and water users associations (Johnson, forthcoming). Irrigation management transfer has taken many forms in different countries but one common element has been a reduction of the role of the government and a corresponding expansion in the role of farmers and non-governmental organizations in irrigation management (Vermillion, 1992). In order to determine how policy reforms of the 1980s in China have been translated into new local institutional arrangements and management practices, and have led to changes in irrigation performance, the International Irrigation Management Institute (IIMI) and the Shijiazhuang Institute of Agricultural Modernization (SIAM) have carried out a collaborative research project in two medium-scale imgation districts, Nanyao and Bayi, in Hebei Province in the North China plain.

The overall objectives of the study were: (1) to identify and document management policy changes before and after the economic reforms; (2) *to* document the process by which transfer of management responsibility have occurred; and **(3)** to assess *the* impacts of these changes on systems performance and financial sustainablility. The purpose of this paper **is** to present preliminary findings related to the impacts of these changes on institutional arrangements, irrigation management and system performance.

Sample Irrigation Districts

The two irrigation districts selected for the research study are located in Shijiazhuang Prefecture of Hebei Province. Bayi Irrigation District (Bayi ID) is located in Yuanshi County while Nanyao Irrigation District (Nanyao ID) is located in Pingshan Country, both of which are near 38°N latitude. The location of these counties within Hebei Province can be seen in Figure 1.

Bayi ID

The arable land area of Bayi ID is 10,415 ha. Within the district most of the soil is loamy with a medium level of soil fertility. Average annual rainfall is 544 mm, with the majority of this concentrated from June until September. However, the annual amount varies widely, from as low as 250 mm to over 1,200 mm.

The source of water for the district is the Bayi Reservoir with an overall capacity of 73.87 million m'. The development of Bayi ID was started in 1959 with the construction of the Bayi Reservoir. Originally, the design area was 13.000-20,000 ha. Starting in 1961, only a fraction of the design area was irrigated. By 1967 the construction of the reservoir was completed and the irrigated area rose to 5,333 ha. The main canal is 5.4 km long with two main branch canals of 13.5 km in total length. Primary canals are 16 km long and the secondary canals extend 104.4.km. Within the system there are over 1,400 structures. There has been no rehabilitation since 1976 when a limited amount of canal lining was done on the main canal and some of the branches. Figure 2 illustrates the canal layout of the irrigation district.

The Bayi Reservoir was not able to provide all the irrigation water required for Bayi ID. Consequently, a canal from the Gangnan Reservoir-a large reservoir on the Mountain Taihang--was started in 1970 and completed in 1976. Since the completion of the Yingang Canal, Bayi ID has been able to purchase water from Gangnan Reservoir. This transbasin conveyance project ensures irrigation water for Bayi ID. Twenty to thirty million m' of water is purchased annually.

In addition to surface water, the groundwater table is about 17 m below the surface. In order to tap this resource, there are 1,074 tubewells within the command area. About 4,000 ha can be conjunctively irrigated with both canal and well water. However, due to overpumping the water table in the county fell dramatically during the 1980s. In 1979 the average depth to the water table was 11.9 meters, while in 1993 the depth to the water table was 25.5 meters. In some areas it declined at the rate of 1.1 m/year while in other areas it declined in excess of 1.5 m/year. The pumping rate is 120 million m^3 while the annual recharge is 100 million m^3. In order to address this problem, since 1989 the district has received about 20 million m^3 each year from the Yehe River in an attempt to stabilize groundwater levels within the county. In 1989, the district paid Yuan[3] 0.7 per 100 m^3 and in 1991, 1992, and 1993 they paid Yuan 1.1 per 100 m^3 for this water.

The population in Bayi ID is approximately 90,200 which includes 18,53 1 male laborers and 13,808 female laborers. There are off-farm employment opportunities as well as agricultural income, and therefore the income in Bayi ID was 670 yuan in 1991, while the average in Shijiazhuang Prefecture was 650 yuan. The literacy rate within the district is estimated at 80%.

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[3] Exchange rates for the Chinese yuan for the last six years have been one US dollar equals: 4.72 yuan (1989); 5.22 yuan (1990): 5.34 yuan (1991): 5.78 yuan (1992); 8.8 yuan (1993): and 8.6 yuan (1994).

Nanyao ID

Nanyao ID was designed in 1957 and in 1958 construction was started. Funds for purchasing materials were provided by the townships and volunteer labor was provided by the villages. Therefore the degree of government subsidy in the system was very small. There was a significant amount of rehabilitation in 1977-80, with almost all the labor coming from the farmers. The county contributed 200,000 yuan for materials only.

Within Nanyao ID the total arable land area is 3,333 ha. The soils in Nanyao are a sandy loam with lower levels of fertility than Bayi ID. Average annual rainfall is 535 mm, with the majority of the moisture concentrated in the period from June until September. However, the annual amount varies widely, from as low as 200 mm to over 950 mm. The water source for Nanyao is the Yehe River, which originates on the Shanxi Plateau and passes through Pingshan County before joining the Hutuo River. The average discharge of the river is 100 m^3/s, although during the flood season discharge increases to 500 m^3/s and during the *dry* season decreases to 20-50 m^3/s.

Designed discharge at the head of the main channel is 15 m^3/s. Within the irrigated area of 2,473 ha, *the total* length of main canal, branch canals and sub-branch canals is 111.5 km, of which 39.6 km is lined. The main canal is 30.3 km with 18.6 km lined. There are 339 structures within the system and total water discharge varies from 10.4 million to 59.4 million m^3/year. System level water use efficiency is 53%. Figure 3 presents the canal layout of the irrigation district.

The population in Nanyao ID is 35,545 with 7,112 male laborers and 5,405 female laborers. Income is almost exclusively from agriculture and was 414 yuan/capita in 1991. The literacy rate is approximately 77%.

Agricultural Production

Once irrigation water was available, agriculture. production in the two districts shifted from rainfed to irrigated crops. In Bayi and Nanyao, winter wheat and summer maize are the main two crops, with cotton, vegetables, water melon and fruit orchards making up the other major crops. In addition, a small area is planted in rice in Nanyao ID. Table 1 presents the detailed area of the different crops as well as the percentages of the total.

As the climate in the area is hot and wet in the summer and *dry* and cold in the winter, rainfall during June to September is about 80% of the total annual rainfall. From October to May, the growing season for winter wheaf only about 150 mm of rainfall is available. As this is far below the requirements for wheat, irrigation is required. Generally, rainfall during the summer is sufficient for a maize crop and no imgation is required during normal and above normal rainfall years. Table 2[4] presents the winter moisture regime for the two irrigation districts. As can be seen in the table, a wheat crop generally requires at least 350 mm of supplemental moisture.

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[4] Note: Tables 2 and 3 were developed by using the UNFAO CROPWAT program, as part of the collaborative SIAM-IIMI case studies.

The water requirements for maize are in stark contrast to the water requirements for wheat. As can be seen in Table 3, during the average year moisture from rainfall is such that it actually exceeds the evapotranspiration requirements. Therefore, in many years maize does not require irrigation. In order to ensure that maize has sufficient moisture, farmers often relay plant the maize in the wheat and then germinate the maize seeds using moisture from the last irrigation on the wheat. In this case, the last imgation for wheat has a dual purpose. However, during dry years maize will often require one or two irrigations to obtain high yields.

Irrigation Management Changes due to Rural Reforms

Organization of irrigation under the collectives

Before the Peoples' Communes were dismantled in 1983 (Shue, 1984), they were at the top of a three-level arrangement for organizing agricultural production and distribution and irrigation development and management. Communes were generally the size of townships and consisted of 10 to 15 production brigades. A brigade generally consisted of several production teams which were the basic units for organizing agricultural production. Teams consisted of 10 to 20 households. Payments to farmers in cash and goods were made on the basis of the amount of work points farmers eamed through their farm labor and attendance at communal works activities, including irrigation construction and maintenance.

Irrigation development and management was directed by county level water resources (or "conservancy") bureaus, under the Ministry of Water Resources. At the irrigation system level, bureau staff coordinated irrigation management with the aid of labor assignments made by the commune. During the 1950's, 60's, and 70's about two-thirds of government funds allocated to the water sector were for construction and one-third were for operations (Gitomer, forthcoming). Subsidies from both central and provincial funds and from communes supported the management of imgation systems. General labor on irrigation systems was paid by communes in work points. Irrigation managers were salaried officials of the county water resources bureau. The costs of irrigation O&M not paid by commune revenues was generally funded by the Ministry of Water Resources.

Change at the National Level

As a result of inefficiencies and declining central government revenues available for investment in rural development, two sets of policy changes had a major impact on the rural sector.

- The first policy change, which is really a package of several reforms, was the ***production responsibility system (PRS)*** that replaced the Peoples' Communes in the early 1980's. Under the PRS, households were allocated long-term leases on farm land that had previously been communal production land and were free to organize their own production and marketing, decisions that were previously made by the production team. In addition, individual households could retain profits from their production. The government encouraged this change, by providing a general 50

percent increase in the grain procurement price.

- The second policy change was a general retrenchment of public investment. Government investment in the countryside, particularly in capital construction, dropped dramatically. Government subsidies for irrigation construction declined by over 60% from 3.49 billion yuan in 1979 to 1.3 billion yuan in 1981 (Gitomer, ibid). Between 1979 and 1985 government irrigation construction investment declined as a percent of gross domestic product from 0.87% to 0.21%.

While the change to the PRS system (combined with the higher grain purchase prices) resulted in an immediate increase in agricultural output, the precipitous decline in government subsidies to the local level, combined with a disruption of the communal organization of irrigation maintenance, led to a 2% decline in irrigated area. Between 1979 and 1985 net irrigated area was reduced from 45 to 44.04 million ha.

The reforms initially led to confusion within the irrigation sector. During the early 1980's there were widespread reports of chaos, water conflicts and rapid deterioration of irrigation infrastructure. Farmers wished to work their fields rather than volunteer labor to maintain irrigation infrastructure. With the new economic incentives, farmers were interested in increased output, which required higher quality irrigation service. Yet, as a result of the reforms there was confusion within the villages and the agencies about roles and responsibilities. As government personnel no longer had the authority to force farmers to volunteer their labor for irrigation related work, irrigation systems fell into disrepair. In addition, theft and stealing of water occurred as there was no effective enforcement system.

With the improvement of markets for agricultural inputs and outputs, the communes began to obstruct input and output flows rather than facilitate them. As it became obvious that there was a basic conflict between the incentives of family farms and the communes, this led to a second stage of reforms; that of dismantling the communes, which was effectively accomplished by the end of 1983 (Gitomer, 1994). Observing the impacts of these policy changes, in the early 1980s the government began introducing a third series of reforms, starting with relatively modest measures and moving to progressively more fundamental changes.

- The first reform was the ***work post responsibility system (WPRS)*** introduced in the early 1980's. This was an attempt to introduce a system of incentives to water resources bureau officials to improve their work productivity. It was seen as a counterpart to the agricultural production responsibility system. Monetary bonuses and penalties were introduced in annual work performance evaluations amounting to 20% or more of base salaries. For collective-owned systems, a revolutionary reform system was implemented, the ***economic contract responsibility system (ECRS)***. Although originally limited to small irrigation systems, in many cases, elements of the ECRS have also been implemented within larger government imgation systems. The county water resources bureaus remained intact with the demise of the communes.

- After collectivization the Ministry of Water Resources added a lower tier below the county level, the *water resources stations* which were created to replace production brigade functions at the township level.

- ***Village irrigation management groups (VIMGs)*** were created at the village level following the demise of the multi-functional production teams. These were to be under the jurisdiction of village governments but were managed and financed independently from the village government.

Two more far-reaching reforms were introduced through national regulations, both of which were decreed in 1985. These were:

1) The national ***Regulation on Water Fees*** . The regulation on water fees stated the principle that revenues for operations and maintenance of irrigation districts should come mainly from fees collected from water users. The precise level of fees should be determined at the system level according to the local cost of O&M. However central and provincial governments continue to place ceilings on the maximum level of fees which can be charged to farmers, thus even with 100% collection rates, fees generally did not provide for the full cost of O&M, let alone for rehabilitation and capital replacement costs. **The** water fee regulation supported development of a widespread tri-partite system of resource mobilization. This included a fixed area fee (based on the area irrigated by a farmer), a volumetric fee (based on estimated volume of water diverted into a farmer's field), and an annual labor contribution[5] for system maintenance.

2) The State Council *Regulation on Diversified Sideline Enterprises*. Irrigation districts often had underutilized assets and resources which had potential economic value. There was generally a gap between the level of resources which could be raised by the irrigation fees (because of political reluctance to require farmers to pay for the full cost of irrigation service) and the actual costs of operations and maintenance. By the 1980s salaries of irrigation district officials were dropping in real terms below alternative employment opportunities in rural China and **skilled staff** were leaving the service due to low salaries and poor working and housing facilities in irrigation districts. In order to bridge the gap between the **liited** revenue which could be raised from fees and the amount needed for O&M and to boost salaries and facilities for irrigation workers, the government introduced the concept of diversified sideline enterprises into the irrigation sector. Irrigation districts were encouraged to develop sideline enterprises to raise additional revenue. Profits from these businesses were to cross-subsidize the costs of irrigation management. By 1988 it was official policy that no central or provincial government funds could be used for regular O&M in irrigation districts.

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[5] This is not a minor input. Chen **and** Ji (1994) estimate that contributed farmer labor constitutes more **than** one-third of the total value of resources invested in existing irrigation districts.

These broad national policy reforms were partly the result of a combination of financial and managerial pressure at the national level and "a process of experimentation and trial and error" at the local level (Gitomer, 1994 and 1985). They resulted in a variety of organizational arrangements throughout China at the level of irrigation districts. A central aspect of improved water resource management has been the issue of financing. Significant efforts have been made to encourage lower level water conservancy bureau and irrigation district officials to achieve financial independence from the Cenhal and Provincial Governments. Local financing approaches include (Turner and Nickum, 1994):

1) increasing imgation fees and collection rates;
2) stimulating investment from private sources;
3) creating joint stock cooperatives;
4) borrowing from domestic and international banks;
5) soliciting aid from international organizations; and
6) establishing and managing sideline economic enterprises to earn additional income.

In some instances, imgation districts are being managed by small, locally-contracted "irrigation management firms" which receive multi-year contracts from villages or irrigation districts, depending on the level of management involved (Svendsen and Vermillion, 1992)

Organizational Changes in Nanyao and *Bayi* Districts

The third area of reform was a significant change in the role of the VIMGs. Under the commune system, operations and maintenance of the districts was handled first by water conservancy groups, created in 1964. These were soon absorbed financially and managerially by the collectives and later, villages. Irrigation staff interviewed in this study reported that under the commune system responsibility was often confused and coordination was difficult because irrigation matters were handled by busy multi-functional production brigades and later, by village committees. Irrigation district staff had little authority relative to the communes. When the production responsibility system replaced the collectives, water resource stations and village committees replaced brigades and production teams, respectively.

As part of the reforms begun in the early 1980s, VIMGs were organized in Pingshan and Yuanshi counties to take over direct responsibility for managing irrigation. A VIMG generally has about three to five members, selected by the farmers in a village. VIMGs normally have a head, a deputy (who inspects canals for problems or damages), a treasurer, a head of water fee collection and a head of maintenance. Their duties are to clean canal sections which pass through the village (normally branch canals and below), distribute water among village farmers, collect water charges ("under the supervision of the ID"), ensure proper passage of water through the canals and maintain, organize schedules among farmers for water delivery and protect field-level irrigation facilities of the county water conservancy bureau (WCB). The VIMG head often is also an official on the village committee. Each VIMG staff has responsibility for coordinating water distribution between roughly 200 households farms.

At present, in Nanyao ID in Pingshan County, the top two levels of canals are managed by the irrigation district and the third and lower-level canals are now managed by VIMGs. Nanyao ID has five levels of canals (as do most districts in both counties). The district office has two tiers, the main office and four sections which are subdivisions of the system (Figure 4). Nanyao ID has 30 staff members plus 5 temporary workers. All receive their total salaries from the water charge. The main office has three managerial sections, canal measurement, engineering and irrigation, and financial and administrative. Nanyao has 40 VIMGs. It has not yet developed any sideline enterprises under a "Diversified Management Division."

Bayi ID has four tiers of organization: 1) the main office, which oversees the entire system and operates the reservoir, 2) five technical and administrative units, 3) four sections, which manage the main and branch canals and liaise with VIMGs, and 4) the VIMGs (Figure 5). Bayi ID (including the Reservoir) has a total of 67 staff, 20 of whom have temporary status. Thirty-two staff are performing water management functions (12 are engineers) and 35 are in the "Diversified Management Division," producing revenues from sideline enterprises. All 32 staff in the Irrigation Management Division (IMD) are ID employees and receive all of their salaries and pensions from Bayi ID, not the county water conservancy bureau. None of the staff are civil servants under the water conservancy bureau. Hence the irrigation district is an independent public utility, not part of the government bureaucracy. Bayi ID has two divisions, Irrigation Management (which is responsible for O&M and technical matters) and Diversified Management (which manages sideline enterprises). The district has 45 VIMGs.

In both districts functions of the section level staff are to:

1) adjust gates along the main canal (gates along branches are operated by VIMGs);
2) maintain the main canal (mainly by planning and coordinating fanner labor);
3) pass announcements from the irrigation district or county water conservancy bureaus to villages (especially informing villages about section-level meetings for scheduling water deliveries between villages);
4) settle disputes between villages over water use (disputes often occur over which village irrigates first); and
5) encourage VIMGs to pay water fees on time.

Post-Reform Management Practices in the Two Irrigation Districts

Performance Standards

Under the work post responsibility system, yearly personnel evaluations of district and water conservancey bureau staff are required. For irrigation district staff these include an assessment of water fee collection rates, the quality of maintenance work and water distribution. Both Nanyao and Bayi make annual assessments of staff and district management performance according to the same basic set of eight "economic norms" (or performance standards) promoted by the work post responsibility system. They vary in how they calculate points, bonuses or fines. Assessment is done at the level of individual staff, section offices, divisions and at the district office level. The eight

criteria used are: irrigation efficiency, proportion of structures which are functional, balance of income and expenditures, total water use, irrigated area, water use efficiency, irrigation schedule targets and crop yields obtained.

Performance standards are set for each of these criteria and percentage figures *are* used *to* measure levels of achievement relative to that standard. If a **staff** gets a rating below 60%, no annual salary bonus is given and salary is **reduced** by one grade for that year. In these two districts, this has not happened yet. Table **4** shows the system of performance measures used in Nanyao ID in 1993. The rating was 96.5% of potential. In comparison with problems of advancing siltation and deterioration, this rating lends some support to Nickum's argument (1985) that the water fee assessment system in China is only used in a modest way to remind staff not to shirk duties too much. Scores tend to be stable in most years. The overall annual performance rating for Nanyao ID increased from 81 points in 1987 to 96.5 points in 1993. This was likely a combination of some "rating inflation" and real improvements.

Apparently as a gesture to increase work incentives, Nanyao recently decided that from 1994 onwards, if a staff member is ranked below 79% they get no bonus and the salary will be reduced by one grade. For scores above 79%, the higher the score the higher the bonus. Staff grades generally increase according to seniority, promotion and performance ratings according to the guidelines of the National Personnel Ministry. Grade levels determine salary. The Labor Ministry designates base salary levels for all kinds of positions, even in financially independent irrigation districts.

Irrigation fees

Water rates and, therefore, actual water costs to the fanners have gone up significantly since the mid 1980s when the reforms were implemented **This** is based on the principle, ***He who benefits must take responsibility for management and make investments.*** In both sample districts, irrigation water fees **are** a combination of a fixed fee based on irrigated area, and a volumetric fee based on water used. For Nanyao ID the rates **are 1.5** yuan/100 m^3 and 112.5 yuan/ha, while Bayi ID presently charges 7.19 yuan/100 m^3 and **15** yuan/ha. In Nanyao, volumetric charges are only charged at the main canals as they do not have measuring devices at the sub-branch level. Therefore, at the Village Irrigation Management Group (VIMG) level farmers **are** charged a flat rate of yuan 225 per ha for irrigation water.

Figure 6 illustrates the historical trend of water fees for the two districts. This data is in constant 1991 Chinese yuan so the significant increases **are** real, not just reflections of inflation in the Chinese yuan. **As *can*** be seen, in Nanyao the rate based on volumemc flow is less than the 225 yuan **per** h a The additional funds collected **are** used to pay lower level irrigation **staff** and provide incentives to the VIMGs to ensure they collect 100% of the water fees (Johnnson, et al, 1994).

In Nanyao, if the VIMG collects 100% of the fee by the end of March, the VIMG retains **5%** of it. If they collect 100% by the end of **April,** the VIMG retains only **3%. If** the VIMG collects less **than** 100% by May then the VIMG must pay a fine of an additional 3% of the remaining amount

uncollected. The entire fee for the year is collected once a year, in February, 10 days before the first irrigation. Fee collection rates for 1993 were 97%, 90% and 95% for each of three sections.

In Bayi before 1984 the water fee was only a fixed area fee so the use of water was very inefficient. The volumetric water fee was introduced after 1984 as part of the reforms. The Hebei Province standard rate for the volumetric fee was 3.0 yuan per 100 m3, but since Bayi ID purchases water from the Bayi Reservoir and sometimes from another county (Pingshan) and have more than 100 kms of canal to supply this water to the district, they have a higher fee based on the actual higher costs for water. The Bayi Reservoir and ID propose a fee level which is approved by the county government. based on the provincial standard modified to *take* into account actual local costs. In this respect, the water fee standards seem to be considered more as guidelines than rules.

In about two-thirds of the villages in Nanyao ID, the VIMG collects water fees from individual farmers, in the other third the villages produce enough off-farm collective income that the village committee pays all of the water fees charged to the village and often also pays for other agricultural taxes, educational fees and village fees. For example, Dong Hui She village has successful collective enterprises, including a brick factory, fertilizer bag production plant and fruit orchard. Eighty percent of the factory workers are also farmers from the village. Workers are paid on a piece rate basis. Dong Hui She village paid 100% of its water fee by March *5* in 1992 and 1993 and thereby received a 5% rebate.

Bayi ID collects the water fee from farmers, through the VIMGs, three to five days before the village's scheduled water turn. The VIMG broadcasts with megaphones announcements of pending water delivery three to five days in advance, reminding farmer to come and pay their water fee before delivery. Two members of the VIMG wait at a designated location for farmers to come and pay. At least two VIMG staff must together receive water fees. A receipt is issued to farmers upon payment. Normally 90% of the farmers pay the fee in advance of the water delivery. Others still get water but must pay afterwards or they won't be allowed the next water turn until they pay--but this is reportedly "very rare."

Compensation of VIMG staff is sometimes from the village committee funds and sometimes from a village-levied surcharge on the water fee. Compensation to VIMG staff ranges from 400 to 1,000 yuan between different villages, varying by the size of village irrigated area, amount of work required and differences in wealth between villages. Most villages in Bayi ID have a surcharge on the water fee of about *2* to 5% to pay for the cost of compensation for VIMG staff.

Financial ***Management***

Under the collectives or village committees, general commune or village revenues subsidized routine irrigation costs. Central and provincial level funds are now only available for construction and rehabilitation on a cost-sharing basis with villages or farmer groups. Financing routine operations and maintenance has always been the responsibility of the irrigation districts and farmers. Officials report that neither Nanyao nor Bayi ID have ever received central government funds for routine operations and maintenance.

While no funds are provided by the government for O&M, between 1988 and 1992 the county water conservancy bureau provided 519,000 yuan (approx. US $85,000) to Bayi ID for canal lining and extension. This amount was one-third of the total expended. As required matching investments, the same amount was invested by both Bayi ID and member villages (mainly in the form of labor), respectively.

In 1992 Nanyao ID's total budget was approximately 365,000 yuan (about US $ 63,000), 350,000 yuan of which was from the collection of current and back accounts for water fees. Expenditures totalled 341,500 yuan, including a 36,500 yuan repayment of its 1991 budget deficit. Nanyao spent 36,500 yuan to purchase supplemental water from the Yehe river. Therefore, Nanyao had a budget surplus in 1992 of approximately 13,500 yuan.

Between 1984 and 1992 Bayi's Diversified Management Division produced 400,000 yuan (approx. US $60,000) in profits. Of this, 260,000 yuan (65%) was submitted to the ID office to finance water management. The other 140,000 yuan (35%) went to salaries and bonuses for staff of the Diversified Management Division, many of whom are spouses of ID staff. In 1992 total revenues from irrigation fees in Bayi ID amounted to 873,000 yuan, while total revenues (i.e., profits) from sideline enterprises amounted to 103,000 yuan. This total income of 976,000 yuan (approx. US $168,000) produced a surplus of 258,000 yuan (US $45,000) over total expenditures of 718,000 yuan (US $ 124,000). Purchase of water constituted 375,000 yuan or 52% of total expenditures.

At the level of Hebei Province, in 1992 a total of 450 million yuan (US $52.3 million) gross income was raised province-wide by the Water Conservancy Bureau from diversified sideline enterprises. Sixty-six million yuan (US $7.7 million) of it was invested in construction and rehabilitation of water projects. These enterprises also provided employment for 13,155 people.

Performance Impacts of the Rural Reforms

Although there is no question that the rural reforms have resulted in significant changes in the way water resources and, in particular, irrigation are managed in China, the critical question is whether these changes have resulted in improvements in performance. In this section, performance impacts of rural reforms are examined in terms of three aspects: agronomic changes, financial sustainability, and hydrologic efficiency.

Agronomic Changes

As indicated earlier, access to irrigation water significantly changed the cropping patterns in the two districts. Before construction of the irrigation districts in Bayi and Nanyao, the main crops were maize and other spring sown crops such as spiked millet, sweet potatoes, buckwheat, and beans, which are all drought tolerant crops. Very little winter wheat was grown. During the 1980s, after the irrigation systems had been established and were working well, the percentage of irrigated winter wheat and maize in the cropping system reached its highest levels. Recently, however, farmers have shifted to growing more cash crops such as watermelon, vegetables and fruit trees in

order to maximize their income.

Prior to development of Bayi and Nanyao irrigation districts, farmers living in the two regions consumed all their grain production within the household. In fact, in dry yews the Government was forced to provide grain to the rural families in the area at below market prices. After the irrigation systems were constructed, irrigated grain production increased significantly. As a result the farmers sold 1/6th of their winter wheat and 1/10th of their maize production in Nanyao ID and 1/3rd of their winter wheat and 1/10th of their maize production in Bayi ID to the Government With the development of the agricultural production responsibility system there has been sufficient grain after providing their quota to the Government for farmers to have grain for consumption and still have grain to sell on the local market.

Currently in Bayi ID about 1.5 T/ha of wheat is sold to the Government, about 1.5 T/ha is left for farm family consumption and 1.0 t/ha is sold on the free market. For maize about 10% of the total production is sold to the Government, about 65% is sold on the free market and the remainder is used for animal feed. In Nanyao ID, about 0.75 T/ha winter wheat is sold to government the remainder is left for family consumption and only a small percentage is sold on the open market. For maize, about 0.75 T/ha is sold to the Government, half of the remainder is sold on the open market and the remaining stock is used for animal feed.

As a result of increased yields, facilitated by access to irrigation water, chemical fertilizers and pesticides, and new high yielding seed varieties, net returns per hectare have increased significantly. Table 5 compares the yields, input levels and net incomes for Bayi and Nanyao IDs for the 1950s, 1960s, 1970s, and 1980s. As can be seen, the annual combined per ha production of wheat and maize (for the two seasons) has increased from 1,125 kg in 1960 to 11,905 kg in 1992 for Bayi ID and from 5,250 kg in 1972 to 8.500 kg in 1992 in Nanyao ID. At present, the net income for the *two* seasons of wheat and maize is 4,200 yuan/ha for Bayi ID and 3,300 yuan/ha for Nanyao ID. Thus, development of the irrigation systems, combined with implementation of the rural reforms, has resulted in impressive improvements in net income in the two districts. Bayi ID, due to its higher yields, has been able to sustain its growth in net income, while Nanyao ID has seen a drop off of net income as annual per ha production of wheat and maize has stagnated during the 1990s.

Financial Sustainability

Central to the transfer of irrigation management, development and reform has been the issue of financing. In this process it has been critical that farmers and irrigation officials alike recognize that irrigation water is not a free good, but a valuable production resource. Since the implementation of the rural reforms, education and propaganda schemes have been used to educate users and suppliers of agricultural water about the importance of financial stability to ensure long-term security of irrigation supplies.

Prior to the reforms, water fees were paid by the communes and thus "collection rates" were always 100 percent. However, as the reforms were instituted, collection rates dropped drastically

as there was confusion within the irrigation systems about management responsibility. Improved management services and extensive education programs have been used as a mechanism to increase water fee levels as well as collection rates. These approaches have been successful as water fee collection increased from 4.36 hundred million yuan in 1984 to 18.3 hundred million yuan in 1991 and in 1992 they doubled to 35.7 hundred million yuan (all in current yuan). In addition to increased fee levels, collection rates increased from 30 percent in 1984 to 70 percent in 1991 (Turner and Nickum, 1994). The reduction in subsidies and the obvious necessity to increase local funding to support operation and maintenance (O&M) expenses also served to improve fee collection in many areas.

Fee levels and collection rates dropped initially after de-collectivization and then gradually rose as the reforms took effect. In Nanyao ID the water fee collection rate was 100% until 1984 while it was paid by the commune. After, 1984, when the rural reforms were first introduced, due to the confusion and an actual reduction in irrigation service, combined with an increase in the volumetric water fee, the collection rate fell to 85 percent. It fell even further during the period from 1988 to 1991 as the district struggled with instituting a revised management system, including the WPRS. It wasn't until 1993 that the collection rate rose above 90 percent (95 percent). The case of Bayi ID is even more striking. Again the collection rate for irrigation water fees was 100 percent while paid by the commune. When the rural reforms were first introduced in 1983, the water fee collection rate fell to 5 percent. It rose to 80 percent the following year and has been close to 100 percent since then.

Nanyao is a water surplus area and both buys and sells water. However, the increases in O&M costs due to the reforms have forced the actual per ha water costs to increase. As can be seen in Figure 7 the steadily increasing water costs have encouraged conservation in water use, thus per ha water use has declined significantly since the early 1980s.

Expenditures and revenues have both increased since the implementation of the economic reforms. As indicated earlier, one of the mechanisms encouraged to address the need for additional revenue is the development of supplemental market-oriented enterprise. Nanyao ID is in a poorer area than Bayi and it began implementing the reforms later. It has still not developed any sideline enterprises. officials of the ID express a desire to establish sideline enterprises, but report difficulty in raising initial capital and getting organized.

Bayi ID's Diversified Management Division was created in 1984. By 1994 it has become highly diversified. it has 11 kinds of sideline business:

1) survey and design of small scale irrigation projects;
2) fitting of water pipes and taps;
3) repair of farm machinery and imgstion and drainage equipment;
4) well boring and pump installation;
5) building construction:
6) small restaurant;
7) bicycle repair shop;

8) agricultural products store;
9) cobblestone production facility;
10) cement tile and pipe factory; and
11) talcum powder.

Since 1984 Bayi ID has received many prizes and awards from the county, prefecture and province for its successful Diversified Management Division (Wu, 1994).

Within the district, the ratio of gross income from water fees to gross income from enterprises is 5:3. In terms of net income, the ratio is 2:1. Of the 67 employees in the irrigation district, 30 work in water management while 37 are involved in enterprise management. For diversified enterprise management, targets are established based on anticipated net profit. These are normally negotiated between the irrigation district and the enterprise managers. Up to the level of the target, all profits go to the irrigation district. Profits above the target are retained by the enterprise and are usually distributed as profit-sharing among the enterprise employees. In 1992, the irrigation district received 103,000 yuan in enterprise profits. The businesses also provide employment for family members of district staff (as well as others) and thereby enhance the standard of living of staff families.

In the past Nanyao ID has been able to remain financially stable without requiring other income. However, with constantly increasing expenditure levels, the district is actively exploring alternative revenue possibilities.

Hydrologic Performance

One of the most important hydrologic relationships in irrigation management is that between available water and land. In this context, one of the primary **tasks** facing irrigation system managers is to match area to be imgated with the current water supply. Other things being equal, good managers will try to maximize the area served while producing acceptable yields on all of the area. Viewed another way, the manager's **task** is to make each available unit of gross water supply go as far as possible.

In Nanyao, irrigated area has remained almost constant for the last **20** years, suggesting that this is the maximum service area of the system, yet water supply has shown considerable variability over this period (Figure 7). These two facts taken together indicate that water supply is not constraining in Nanyao. Following the canal lining program during the 1977-80 period, it can be seen in Figure 7 that water deliveries increased sharply before beginning **a** steady decline from the 1982 **peak** of almost 60 million cubic meters. Because area irrigated held steady during this period, the result is reflected in the figure as a steady and dramatic decline in the duty of water supplied in Nanyao. Water use **per** unit area today is only one-third of the amount supplied in the early 1980s.

In Bayi, which is located in flatter terrain, only a fraction of the potential command is irrigated, and area irrigated has fluctuated considerably from year to year. Data clearly reflect the impacts of the completion of the Yingang supply channel from Gangnan Reservoir in 1976, as

irrigated area increased dramatically in the following two years, peaking at around 6,600 hectares. In subsequent years, area stabilized at around **4,500** hectares. Figure **7** illustrates the main canal discharge, which also increased substantially after **1976,** but then shows a continuing downward trend from **1979** to the present. Irrigation duty figures in Figure 8 show more variability than do those for Nanyao, but have declined somewhat from peak years.

Even though both systems have shown declining duties over their lifetimes as they come to use water more efficiently, duties in Nanyao are still about double those in Bayi, even though rainfall and cropping patterns are similar. This provides an interesting comparison as clearly Nanyao has much more water than Bayi, yet output per irrigation in water-rich Nanyao is only about one-third that in Bayi as Bayi produces about 3 kg/m^3 of water, while Nanyao manages only around 1 kg/m^3.

Although the levels of other input use must be considered in making a valid comparison of this type, these results *are* suggestive of greater production efficiency in Bayi. It should be remembered that Bayi is producing almost 12 tons of grain/hectare with this water, while the annual output in Nanyao is only about 8.5 tons/hectare. **A** challenge which must be faced in this region is the development of institutions and pricing and marketing systems which will move water from **less** efficient systems to more efficient ones.

Conclusion

National level policy reforms promoting local financial and managerial self-reliance have been adopted, although in a somewhat variable manner, in both Nanyao and Bayi IDs. Nanyao ID has been slower in introducing the volumemc water fees and creating village irrigation management groups. It has still not yet developed sideline enterprises. Bayi ID *started* its first sideline enterprises *in* **1982.** Nanyao ID has a relatively abundant, river-based supply of water and has often been in a water **surplus** situation. Bayi ID is water deficit and must purchase large amounts of water each year. This dependence on water purchasing, together with the greater ability of fanners to pay (due to higher productivity), may be the driving influences for development of sideline enterprises *in* Bayi and more concern about improving water use efficiency. Both Nanyao and Bayi ID's have implemented rules and practices which create **various** financial incentives and accountability mechanisms aimed at enhancing water use efficiency and the transparency of financial accounting and water delivery (Vermillion, et al, **1994).**

It is apparent that the reforms are producing more viable local management of irrigation. They provide reasonably clear delineation of responsibilities, water rights and linkage between rights to water and paying for **it.** Where sideline enterprises have developed they **are** helping to stem the flow of skilled staff out of the irrigation sector by improving facilities and standards of living for families of irrigation district staff and water resources officials. They are also allowing the districts to keep water costs down by cross subsidy.

Farmers must pay the water **fee** in advance in order to receive water. If they do not in fact receive water their fee is refunded. Within limits, farmers may pay a higher level of fee to receive

more water. In Bayi ID, this appears to be a powerful mechanism which achieves an impressive level of performance of water and financial management. The village **acts** as a mediating guarantor to see that these rules apply to the individual farmer. This appears to be resulting in gradual enhancement of self-reliance of irrigation districts. However, as indicated in Nanyao ID, it is apparent that some irrigation districts may need external technical and financial support services to implement volumetric water delivery, fee assessment and diversified sideline enterprises.

The Water Law enacted in 1988 introduced a water extraction permit system, new authority to apply sanctions against water use violations at local levels, and procedures for mediating water disputes. The Law establishes measurable water rights and facilitates the allocation of water between sectors through buying and selling. However implementation of the new Law has proceeded slowly. By 1993 only 11 provinces or autonomous regions had passed implementing regulations for the Law. Over the next decade competition for water across economic sectors will force adoption of the Water Law by the remaining provinces.

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Figure I Hebei Province showing location of Pingshan and Yuanshi Counties

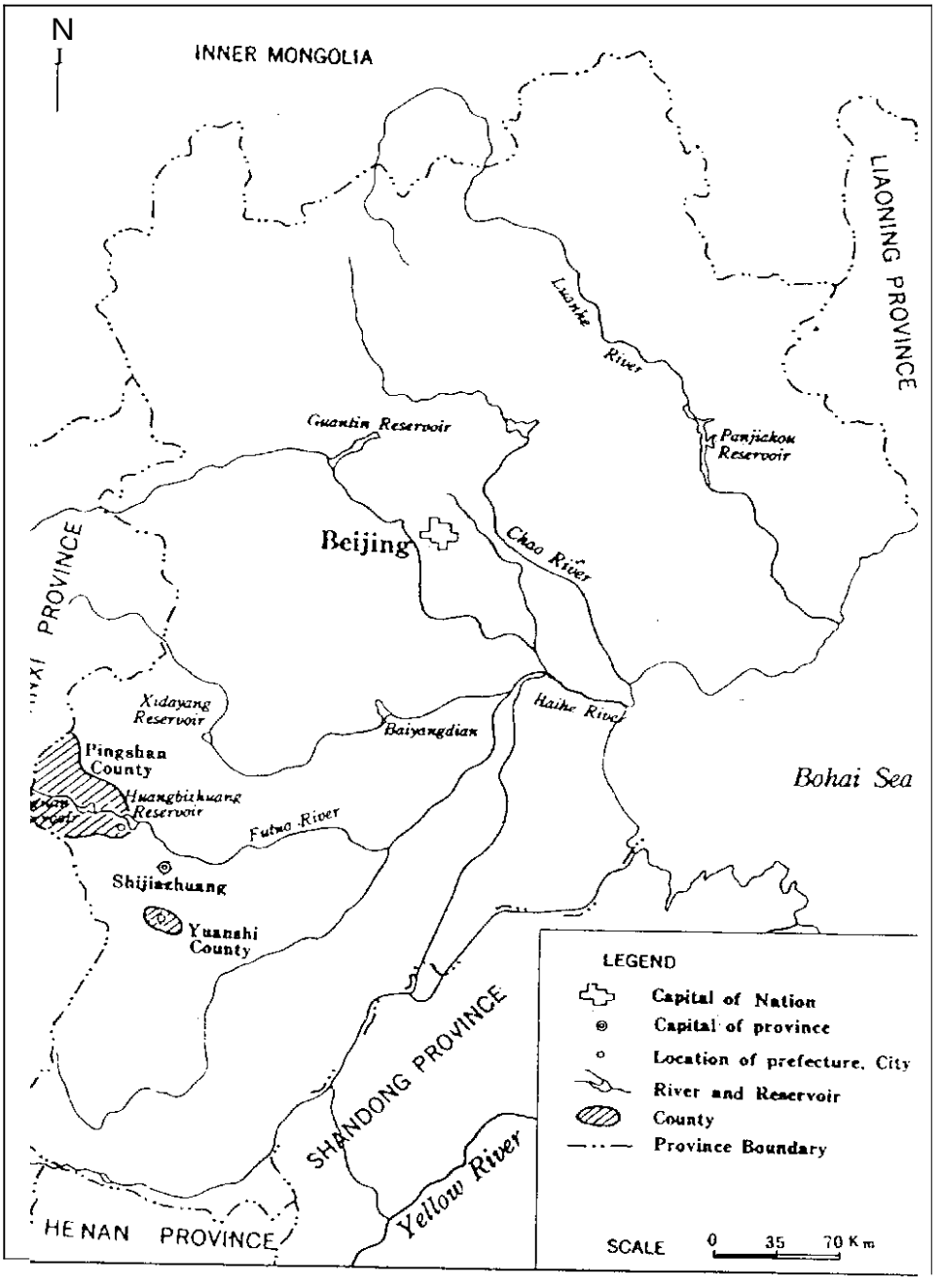


Figure 2 Canal schematic layout for Bayi Irrigation District

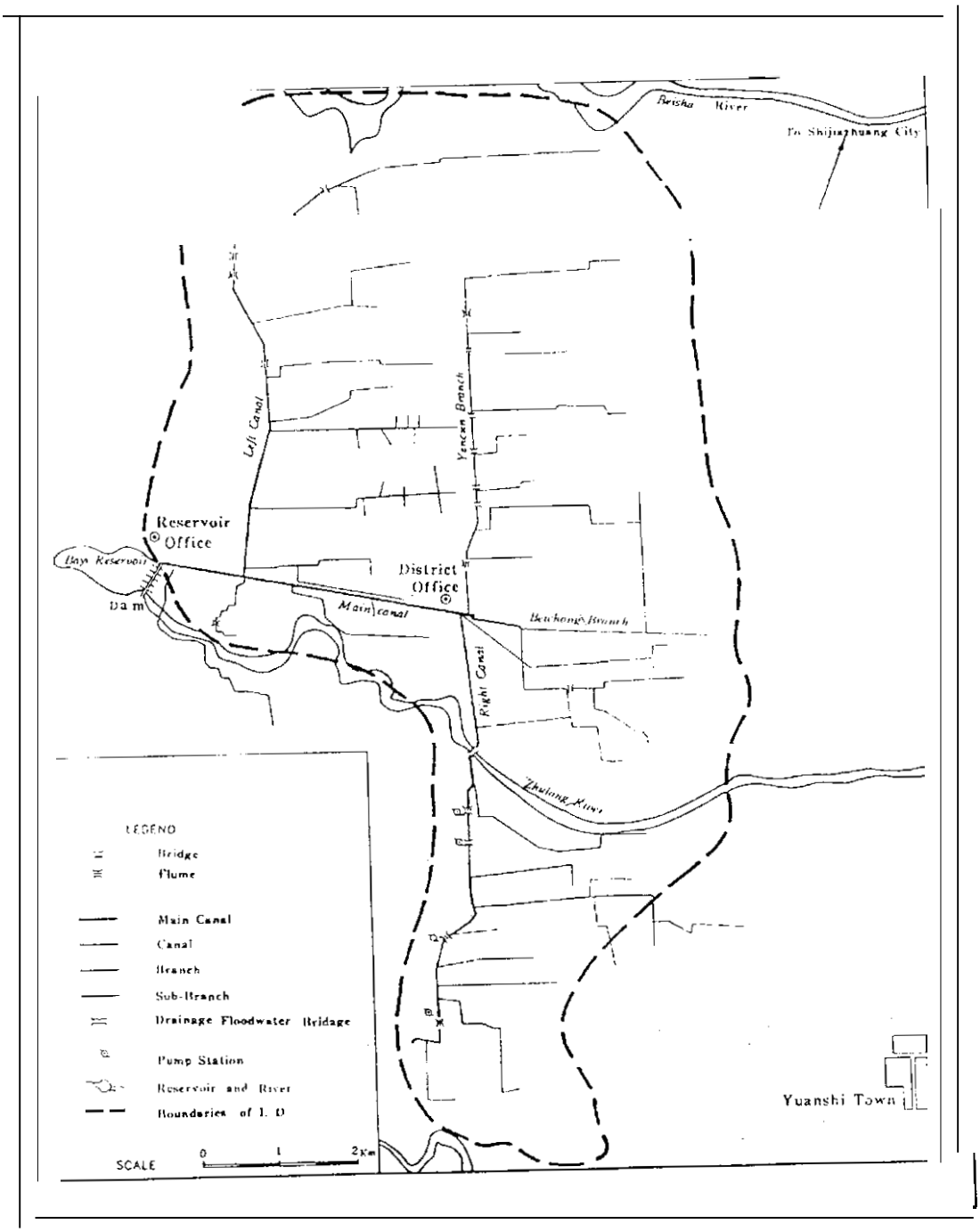


Figure 3. Schematic canal layout for Nanyao Irrigation District

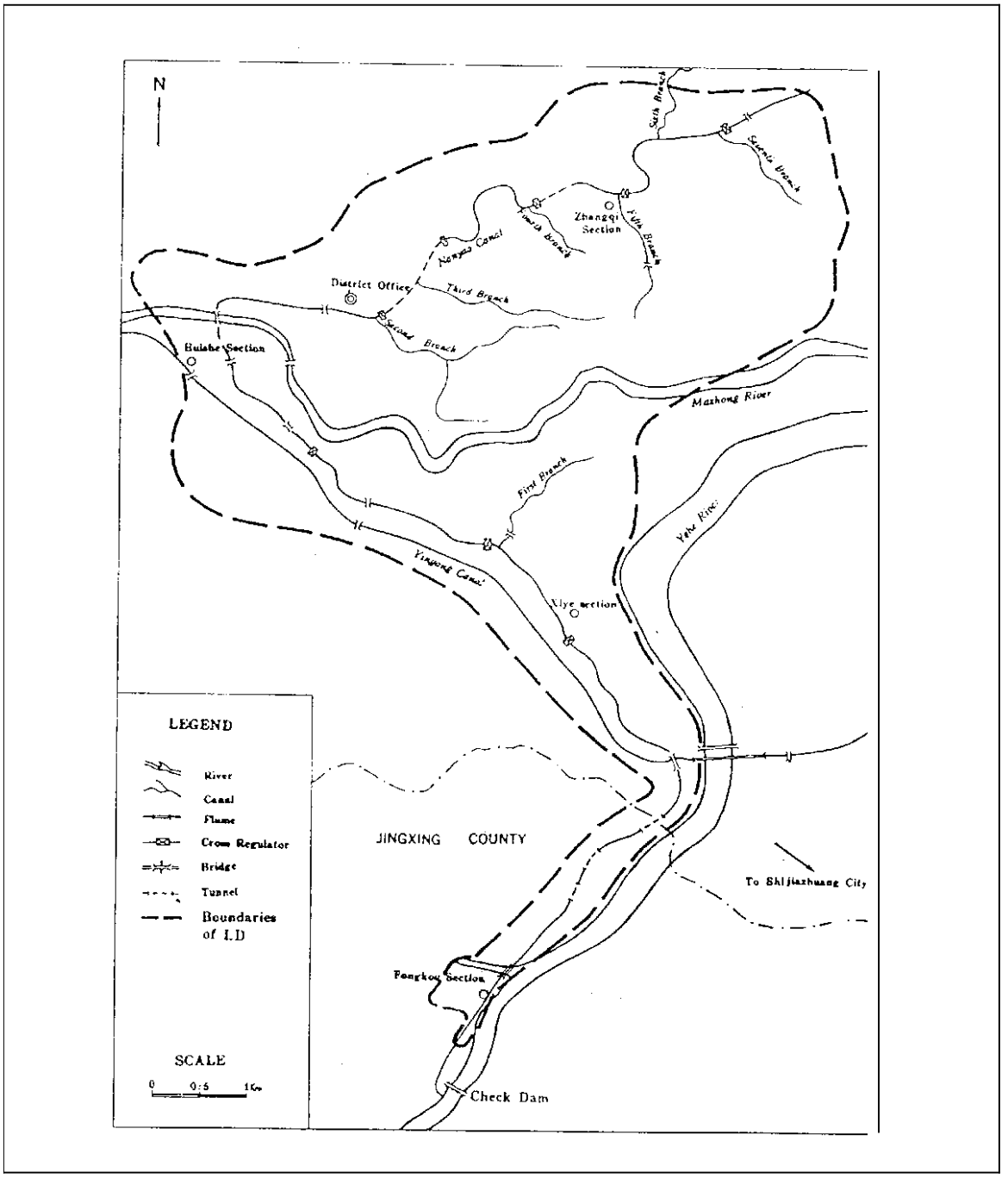


Figure 4 Organizational chartfor Nanyao Irrigation District, Pingshan County, Hebei Province

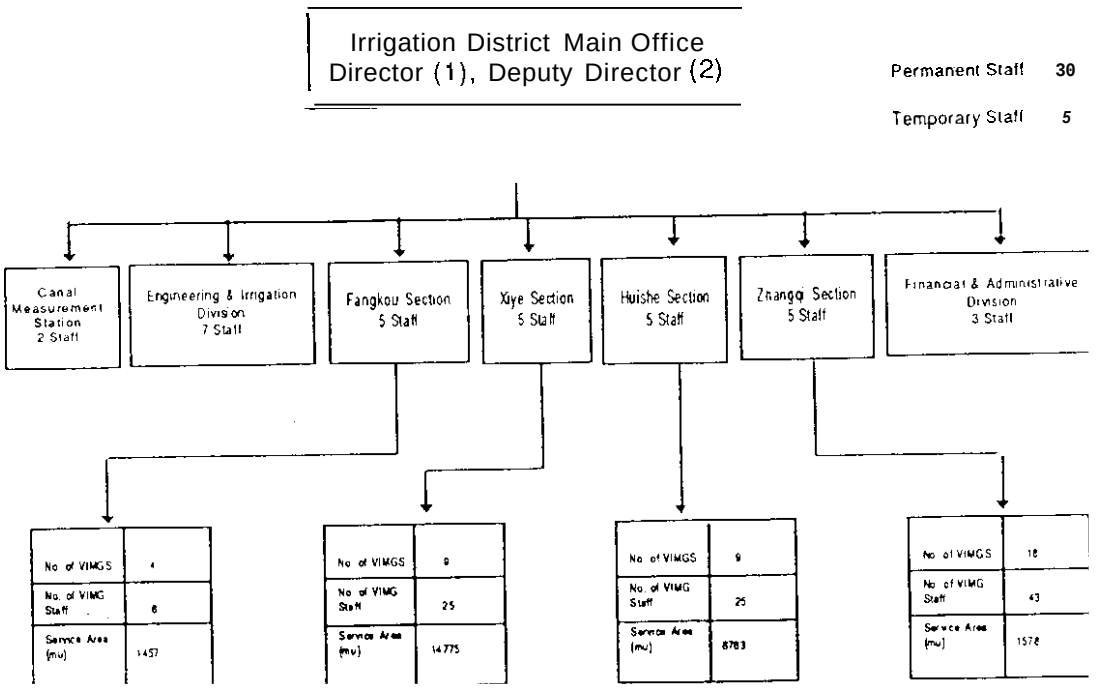


Figure 5. Organizational chartfor Bayi irrigation District, Yuanshi County. Hebei Province

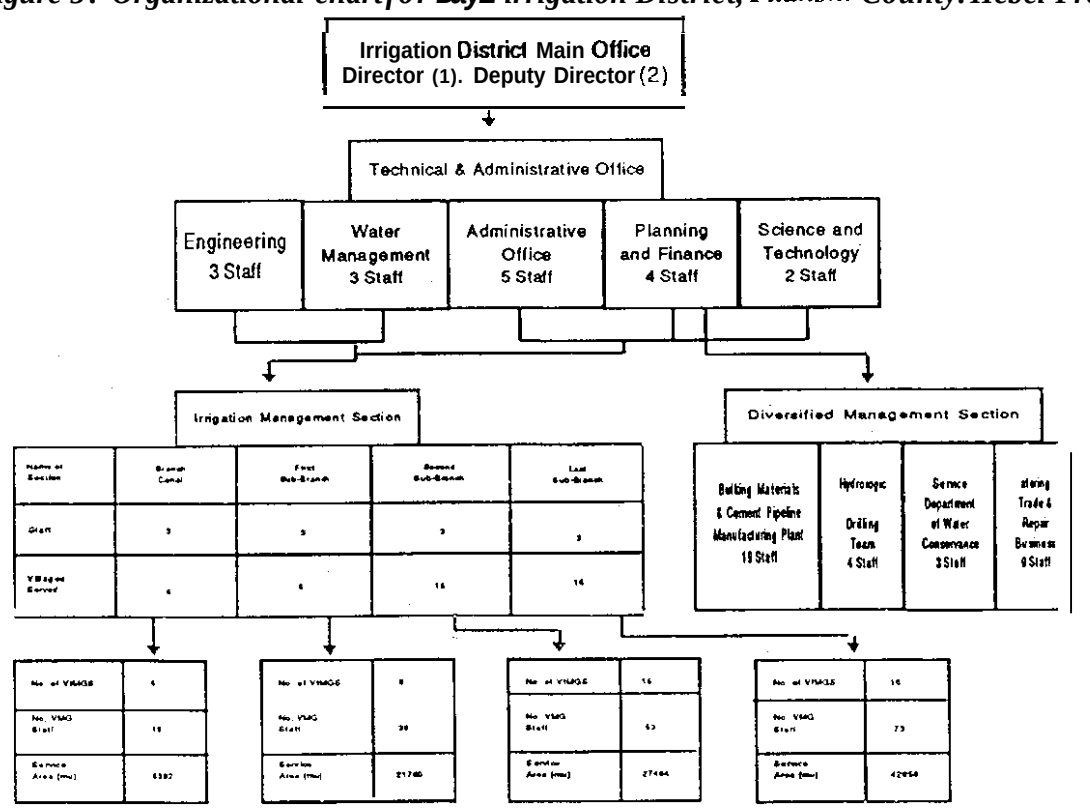
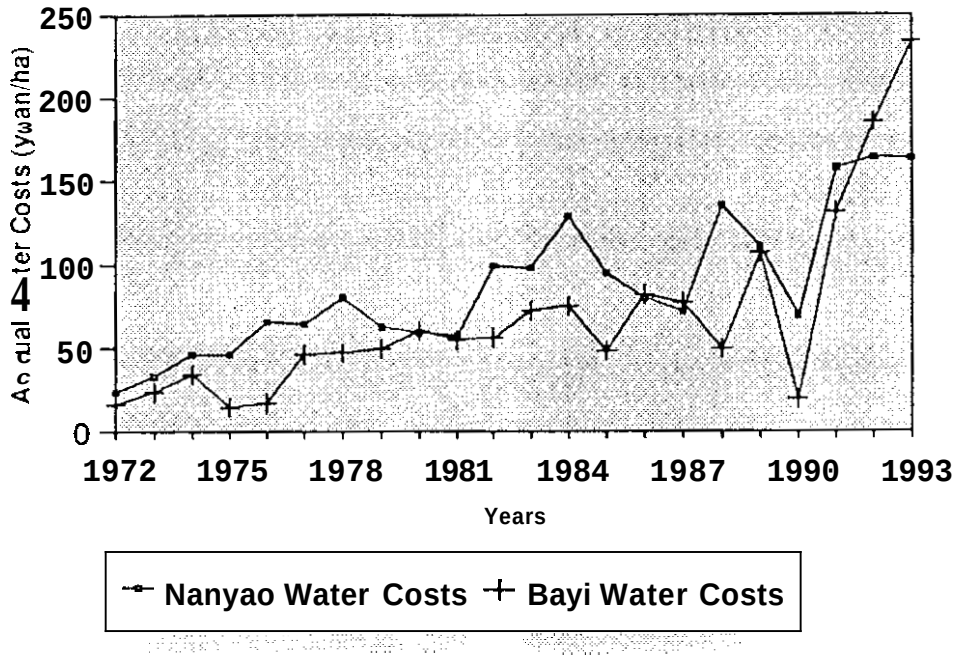
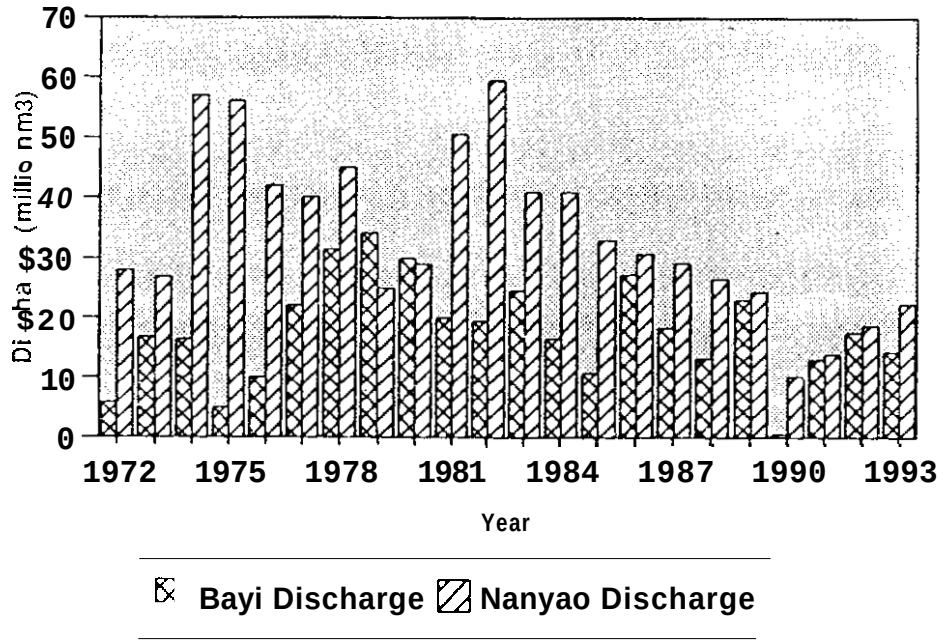


Figure 6. Per ha. annual irrigation water costs, Bayi and Nanyao Irrigation Districts



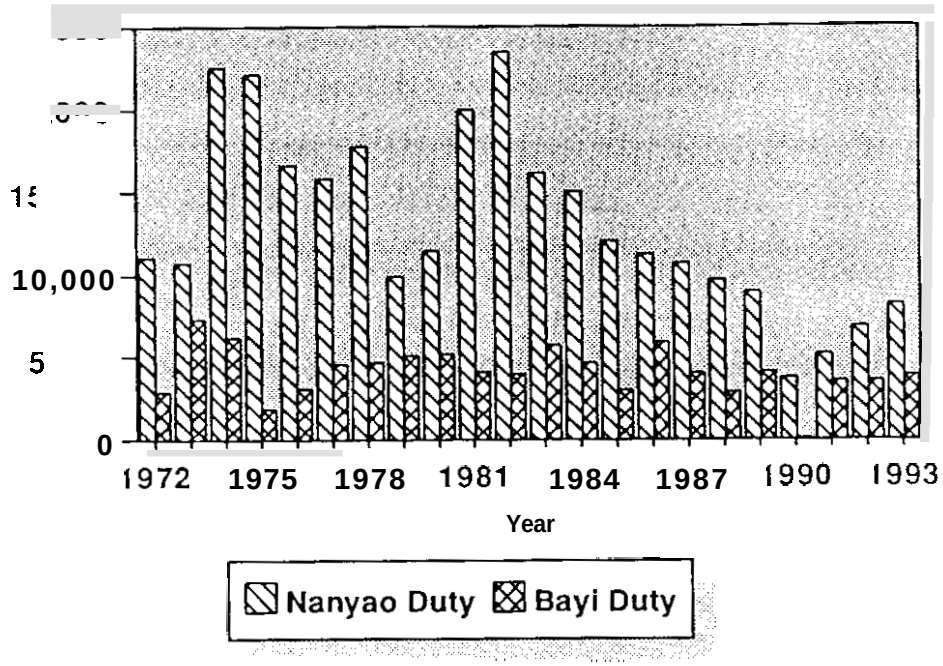
Converted to 1991 Chinese Yuan

Figure 7. Annual main canal discharge, Nanyao and Bayi Irrigation Districts (million m^3)



data provided by Nanyao and Bayi ID

Figure 8. Annual irrigation duty in Bayi and Nanyao Irrigation Districts



Eased on diversion into main canal

Table 1. ***Crop*** *Patterns in Nanyao and Bayi I.Ds* ***(Averuge in 1990s)***

Crop	Bayi I.D		Nanyao I.D	
	Area (ha)	Percentage	Area (ha)	Percentage
Winter - Wheat Maize	7738.9	74.3	2473.3	74.2
Cotton	1385.3	13.3	333.3	10.0
Vegetables	364.6	3.5	93.3	2.8
Rice			66.7	2.0
Water Melon	250.0	2.4	36.7	1.1
Fruit Orchard	177.1	1.7	10	0.3
Sweet Potato	166.2	1.5	180.0	5.4
Spiked Millet	93.7	0.9	50.0	1.5
Drug Plants			16.7	0.5
Beans	83.3	0.8	40.0	1.2
Sorghum	62.5	0.6	23.3	0.7
Others	104.2	1.0	10	0.3
TOTAL	**10415.8**	**100**	**3333.3**	**100**

Table 2. Patterns of water requirements for winter wheat

	Developing Stage	Before Over-wintering	Over Wintering	Turning Green to Jointing	Jointing to Heading	Heading to Maturing	Total
	Duration	1/10-30/11 61 days	1/12-28/2 90 days	1/3-31/3 31 days	1/4-30/4 30 days	1/5-10/6 41 days	263 days
Bayi I.D	ETp*mm	55.4	44.1	55.2	118.8	213.8	484.9
	Average Rainfall** (mm)	47.0	13.1	10.2	20.5	56.6	147.4
	Difference	8.4	31.0	45.0	96.1	157.2	317.7
Nanyao I.D	ETp*mm	50.7	44.1	57.9	118.5	219.6	498.9
	Average Rainfall*** (mm)	43.3	13.5	12.2	22.7	54.2	147.5
	Difference	17.4	30.6	45.7	93.9	166.4	351.4

Table 3. . Patterns of water requirements for maize

	Developing	Early Growing Period	Jointing Period	Heading Period	Milky Period	Total
	Duration	10/6-30/6 20 days	1/7-30/7 30 days	1/8-2018 20 days	21/8-20/9 31 days	102 days
Bayi I.D	ETp[4]mm	44	118.7	85.6	116.6	384.9
	38.8age Rainfall** (mm)	38.82	142.2	110.1	87.89	378.9
	Difference	5.2	-23.5	-24.5	28.8	-14.0
Nanyao I.D	ETp[4]mm	43.2	118.7	**81.3**	116.3	359.5
	Average Rainfall** * (mm)	34.7	147.1	99.3	88.8	369.9
	Difference	*8.5*	-28.4	-18.0	27.5	-10.4

ıble 4 Annual performance assessment for Nanyao ?a District. I 3

Item	Planned (10^4m^3)	Actual (10^4m^3)	Potential Points	Points Awarded
Water Delivery				
Total discharge	4500	5600.6	4	4
Irrigation water	2000	2150.6	5	5
Delivery to Yingang canal	1500	3450	3	3
Water delivery days	300 days	307 actual	3	3
Total points			15	15
Irrigated Area				
Irrigated area	273.3	273.3	5	5
Irrigated area x times	12000	14000	5	5
Total points			10	10
Water Use Efficiency (WUE)				
WUE of main canals	0.715	0.715	4	4
WUE of branches	0.82	0.82	4	4
WUE of sub-branches	0.91	0.91	4	4
WUE of whole canal system	0.534	0.534	4	4
Total points			16	16
Irrigation Duly and Efficiency				
Irrigation duty at the head of *the main canal*(m^3/ha)	1522.5	1519.5	3	3
Irrigation duty at **the** outlet of sub-branches (m^3/ha)	892.5	892.5	2	2
Irrigation duty in field (m^3/ha)	813	811.5	2	2
Annual gross irrigation water per ha.	6870	7815	3	3
Irrigation efficiency at the head of main canal (ha/m^3/s)	56.7	56.8	3	3
Irrigation efficiency at the outlet of sub-branches (ha/m^3/s)	96.9	97.1	2	2
Total points			15	15
Rate of Functional Structures				
Structures	447	447	4	
Canals and branches (km/number)	48	48	3	
Total points			7	
Maintenance				
Lined canals (km)	10	10	6	
Silt clearance (km/number)	271/62	271/62	4.5	4.
Structures maintained (nomhcr)	35	35	4.5	4.
Total points			15	1
Income and Expenditure	US$	US$		
Total income	31,395.3	38,372.1	5	
Total expenditure	26,744.2	36,627.9	5	
Operating and managingcost	20,930.2	56,046.5	3	
Annual maintenance cost	5,813.95	12,558	3	
Total points			16	16
Crop Yield Assessment				
Grain	3262.5	3045	2	
Wheat	4425	4605	2.5	2.5
Cotton	600	585	1.5	
Total points			6	4.5

Grand total potential points = 100
Grand total of points awarded = 96.5

Table **5** ***Inputs*** *and outputs from farming, Bayi and Nanyao Irrigation Districts*

Table 5 Inputs and Outputs from Farming
Bayi and Nanyao IDs

Item	Bayi ID					Nanvao ID				
	1950s	1960s	1970s	1980s	1990s	950s	1960s	970s	1980s	990s
Chem. Fert (yuan/ha)		8	187.5	740	1535		8	187.5	645	126(
Pesticide (yuan/ha)			7.5	105	135			7.5	150	15(
Manure/1 (yuan/ha)	30	30	45	55	55	30	30	45	75	7!
Seed (yuan/ha)	150	180	200	210	390	150	180	200	210	39(
Labor/2 (yuan/ha)	270	270	300	310	270	270	270	300	350	38(
Machinery (yuan/ha)			10	157.5	322.5			10	150	202.5
Water Fee (yuan/ha)		6	8	50	240				52.5	22!
Total Input (yuan/ha)	450	494	758	1628	2948	450	488	750	1633	2683
Avg Yield (T/ha)	1.05	1.6	3.6	8.8	11	0.9	1.4	3.7	7.6	7.6
Market Price/3 (yuan/ha)	0.66	0.87	0.67	0.58	0.69	0.66	0.87	0.67	0.58	0.69
Total Output (yuan/ha)	693	1392	2412	5104	7590	594	1218	2479	4408	5244
Net Income (yuan/ha)	243	898	1654	3477	4643	144	730	1729	2776	2562

/1 manure price = 1 yuan/m3 for 50s, 60s amd 70s, 2 yu /m3 for 80s a l 90s
12 market price using 0.4 x wheat price + 0.6 x cotton-price
/3 labor = 0.3 yuan/day in 50s and 60s, 0.5 yuan/day in 70s and 1 yuanlday in 80s and 90s.

3.4 Case Study on Participatory Irrigation Management in Sri Lanka

IIMI is currently undertaking monitoring and evaluation of the Participatory Irrigation System Management Policy, with funding from the Asian Development Bank and with partial funding from the GTZ (PSM Project). An IIMI associate expert from Holland conducted field research under PSM Program funding during 1994 in the Kaudulla and Mahaweli C irrigation schemes where imgation management responsibility for operations and maintenance has been transferred to fanners organizations at the distributory canal level.

The case study report for the PSM Project will use data from the Monitoring and Evaluation Project to 1) describe the causes and experiences that led to adoption of the policy, b) describe the programs created to implement the policy, c) evaluate the present status and impacts of turnover in Sri Lanka, and d) identify the key factors that have made some efforts more successful than others. Lessons and issues with international relevance will be emphasized, particularly motivating conditions for fanners to take over management, financial viability of local management and the effectiveness of the policy and implementation process. The following is a descriptive outline of the case study.

Objectives The objectives of the study are to evaluate the progress and impact of the participatory management policy in major irrigation systems in Sri Lanka, specifically through the INMAS, MANIS, and Mahaweli programs, and to assist the government to develop improved indicators or systems for monitoring and evaluating the progress and impact of the policy.

Brief Description of Activities The evaluation of progress and impact of the participatory management policy are being undertaken through preparation of a history of the participatory management policy, a reconnaissance study, a process documentation study in six schemes over three seasons to study the ongoing processes in detail, recurrent rapid assessment surveys of 30 sample sites over of three seasons, and a large-scale survey of 50 schemes about 170 farmer organizations to determine the variation in progress and impact in a statistically valid way. Data collection has been completed for all efforts. The reconnaissance data has been reported; the analysis and writeup of the other data is underway.

The development of improved M&E systems is being undertaken through a study of information needs of relevant persons, a review of existing M&E systems, development of indicators, and pilot testing of improved systems. The background studies have been completed, some indicators developed which are being tested against the data listed above, and an improved system has been pilot tested in one scheme. The results are being written up.

Significant Findings The following are a sample of preliminary findings.

Farmer organizations and joint management committees are widespread. They have been created in all major schemes (other than those in security areas). They are also found in most medium schemes including many not formally taken up for organizing. Many of these latter organizations have been created with the help of the Irrigation Department personnel working on

their own and by the Department of Agrarian Services.

There is considerable variation in the strength and peformance of these organizations. Many are rather weak. Virtually all of the farmer organizations and joint management committees have been created along the lines of the INMAS model (field channel groups, distributary canal organizations, project management committees). While this model seems appropriate for all major schemes, it is not appropriate for a significant number of medium schemes where the physical form and/or management systems differ from those in the major schemes.

In almost all cases where farmer organizations have been created, farmers report improved distribution of water, particularly improvements in equity of distribution. Preliminary indications *are* that farmers can cover the O&M costs for distributary and field channels if they wish to do so. However, there is no clear evidence as yet about what choices farmers will make.

There is evidence that some social factors, particularly differences in landholdings and land tenure, affect the organizational strength and performance of farmer organizations. However, in general, it appears that these problems can be overcome in almost all cases with help from the government A major motivation for farmers to take part is that the farmer organizations and joint management committees are recognized by the government and thus offer ways to influence government agency actions. While water distribution has been turned aver to farmer organizations in some schemes, responsibility for maintenance largely remains with the government or is a joint responsibility. To date, no complete turnover has been found.

Impacts This project has stimulated development of monitoring and evaluation abilities within the Mahaweli organization. Also, it is stimulating various discussions of the participatory management policy. To resolve one issue, the project personnel are cooperating with the Imgation Department's Research Management Unit to determine the validity of the contention of some Irrigation Department officers that distributary channels turned over to farmers are not being properly maintained. Also, this **work** has stimulated publication of a special issue of a respected local magazine, the Economic Review on participatory management.

The article below shows some first results of the study in Kaudulla Imgation System.

This is a comparative study on participatory irrigation management in two jointly managed large and medium irrigation systems in **Sri** Lanka. The general objectives of the study are to monitor, evaluate and discuss in what way the services that are provided by farmer organizations at the distributary canal level support organizational and financially viable modes of local resource mobilization, and in what way government agencies, joint management committees and other entities support these farmer organizations. The central focus of the study is on **a)** the.way

participatory irrigation management is financed and its financial viability; b) the viability of multi functional farmer organizations and its impact on O&M performance, cost-recovery and O&M expenditures; and, c) the financial and institutional relationships between these farmer organizations and service providing entities, both from the private and public sector. By comparing two models of participatory management this case study contributes to the more generic and conceptual debate on the different modes and conditions in which water users assume more responsibilities for managing irrigation systems.

The case study compares two different joint management programs on their policies, the way they *are* implemented and their impart on overall agricultural and financial performances and tries to understand. The Integrated Management of Major Irrigation Schemes (INMAS) program began in 1984 under the newly created Irrigation Management Division (IMD). IMD is coordinating its activities closely with the Irrigation Department, as well as with other agencies. The case study (and the article below) report on the progress in participatory management in one of the 37 INMAS schemes: Kaudulla Irrigation System (5,000 ha) in the *dry* zone of Sri Lanka. The second program is a recent participatory management program that was adopted by the Mahaweli Economic Agency (MEA) in 1992. The case study reports on the implementation of this program in Mahaweli System *C* (21,000 ha). The three agencies mentioned above all come under the Ministry of Lands, Irrigation, and Mahaweli Development.

The methodology chosen for this case study is a controlled comparative intensive research (Sayer 1984). The emphasis is on substantial relations of connections, rather than on formal relations of similarity. It tries to develop a causal explanation of events, rather than developing a descriptive representative generalization, Research methods are both qualitative (PRA, group observations, informal and open interviews) and quantitative (semi-structured interviews, 2 small-scale surveys, water measurement) and will cover two seasons (Maha 1993-94 and Yala 1994). The study includes two small fanners-to-farmers training programs. Final presentation and dissemination of the study results are expected in May 1995.

INTRODUCTION

In the first week of May 1994 the Sri Lankan Parliament discussed and passed Amendments to the Irrigation Bill in which farmers' organizations are given the opportunity to operate and maintain irrigation infrastructure below the distributary canal level in exchange for exemption from paying water taxes. The following is an excerpt from the discussion in parliament:

> *The Minister of Forestry, irrigation and Mahaweli Development:*
> *'The Amendments to the Irrigation Bill seek to transfer to farmer organisations mote powers to see that farmers get a better service. The bill does not intend to levy taxes on the farmers, hut farmer organisations will be responsible for the maintenance of irrigation works.'*
> *An opposition MP:*
> *'These amendments could cause burdens on the farmer organisations who will have to undertake the maintenance of the distributary systems which hitherto was done by the Department of Irrigation. If this is the case you must think about allocating a grant for each*

farmer organisation.'

Another ***opposition*** *MP:*

'Youpropose (..) farmer organisations to levy a taxfor the supply of water (..).You are only using these organisations to collect the money for you and make them bear all the responsibilitiesfor this.'

A *Minister:*

The opposition gave a wrong interpretation to this bill. These amendments are geared to bring about more participation by thefarmers in conducting their affairs.'

An opposition *MP:*

These amendments will not benefit thefanners. It is like changing ***pillows*** *for a headache. You have empoweredfarmer organisations to impose levies and supervise the distributary systems. This should be the responsibility of the government.'*

The Minister again:

The bill seeks to get the participation of the Farmers Committees in the management and the maintenance of the irrigation systems. This work is now being done by technical officers. I personally know how inefficient some of them are. (..)farmers themselves would decide whether any taxes are to ***be*** *levied or not. There is no compulsion on the part of the government.* ***As*** *far as the government is concerned the tax is being abolished.'*

('Daily News,' May 4 and **5,** 1994)

This parliamentary debate not only reflects the political sensitivity of farmers' involvement in operation and maintenance (O&M) activities, but also illustrates how the debate on sharing financial responsibility for O&M by levying water taxes or fees **is** mystified by opportunistic political statements on fanners' capacities to financially contribute to irrigation management. Similar to other countries in south Asia (Sampath, 1992; Yudelman, 1993), the cost of operation and maintenance of irrigation systems has been rapidly increasing in Sri Lanka (Aluwihare and Kikuchi, 1991). At the same time, however, new settlements and programs to rehabilitate the physical infrastructure, with or without the involvement of farmers, did not realize the full productive potential of paddy agriculture (Gunatilleke et al, 1992). These developments raise serious questions on the modes of state interventions chosen to increase the growth in irrigated crop productivity and to face the crisis in financing irrigation, particularly with respect to recurrent costs involved in the daily operation and maintenance of the systems.

In Sri Lanka, the discussion on sharing O&M responsibilities started more than one decade ago when the government introduced various participatory management programs (Raby 1992). A major concern about participatory management programs in Sri Lanka is that re-allocation and mobilization of resources jointly by farmer organizations and irrigation agencies have not sufficiently met the official goals of participatory management policies. The expected improvement of irrigation performances and a reduction of operation and maintenance expenditures by the agencies have occurred only in a few cases. On the other hand, some farmer organizations (and within them certain groups of farmers) have used these official policies to meet their own interest; for example, moderate improvements have materialized especially in the spheres of input provision and paddy marketing by some fanner organizations. At present two opposite ways of thinking dominate the discussion on participatory management policies in Sri Lanka. On the one hand some

policy makers, under pressure of the international donor community highlight the moderate successes of farmer organizations and try to apply current participatory management approaches to as many schemes as possible. Problems that have occurred earlier are then likely to be repeated. Others, however, are concerned about the physical deterioration of irrigation systems after farmers have taken over O&M responsibilities and the consequences of this both in terms of productivity and sustainability. They see the lack of some farmers' willingness to really take over the responsibility for operation and maintenance as evidence that "participatory management is a useless exercise" and argue that irrigation agencies should regain full responsibility for operation and maintenance. This viewpoint assumes that the quality of maintenance would have been better if it were the responsibility of the agencies. However, so far, this cannot be sufficiently supported by evidence.

Why have Sri Lankan participatory management approaches failed to go beyond rather limited institutional diagnoses and policy prescriptions, i.e. the establishment of farmer organizations to take over responsibilities from the government? One explanation might be found in the way irrigation is generally financed. Repetto (1986) has described the near-complete absence of commercial principles from the financing of irrigation. He shows how staff of irrigation agencies, donors, consultant agencies, politicians, as well as influential farmers and powerful farmer organizations try to maximize the flow of funds and other resources they control. By using rent-seeking analysis Repetto demonstrates the tendency of public irrigation agencies to try to recover costs for services in a context where there is no official institutional and financial accountability between farmers and system managers. With the absence of accountability farmers fail to pay their fees. And since the agencies do not financially depend on these fees, they have little incentive to provide farmers with a better service, with the result that real improvements in operation and maintenance are not effected. During the last decade the Sri Lankan government declared economic liberalism, with its preference for a private sector and open market economy as the driving force behind development policies (Gunatilleke et al, **1992).** Economic liberalism has also been the impetus behind financial and institutional reforms in the Sri Lankan irrigation sector. Raby (1991) argues that "the compelling motivation for farmer participation in Sri Lanka did not come from the government or managing agencies. It was a result of the pressing economic need to make irrigation systems economically viable enterprises. Financial solvency and profitability are thus the ultimate yardstick for an evaluation of such participatory efforts". However, the question is to what extent has the Government of Sri Lanka implemented financial and institutional strategies that would support these economic policies? Has there been a shift from administered allocation of irrigation resources to market-determined allocation, and has decision making regarding local resource mobilization been decentralized?

This paper addresses the question "How are the operation and maintenance of a jointly managed irrigation system in Sri Lanka financially managed by both the agency and farmer organizations involved?". The paper fiist describes the official goals behind the participatory management policy and then evaluates its achievements in one large-scale scheme. It then identifies some of the strategies farmers and officials have developed to make participatory management financially viable, and discusses whether these strategies have proved to be powerful incentives to improving O&M performance at and below the distributary canal level. Finally the paper questions

the future role of government agencies and farmer organizations in financing locally managed irrigation.

The paper draws on preliminary findings of a comparative study on participatory management in large scale irrigation systems in Sri Lanka.

THE SETTING: KAUDULLA IRRIGATION SCHEME

Policy and Legal Background

The government of Sri Lanka established the Participatory Irrigation System Management Policy through a Cabinet paper in December 1988 (IIMI 1993). Although various agencies have been introducing participatory management programs since the mid 1980s, the May 1994 Amendments to the Irrigation Bill now legally provide that in return for taking over financial responsibilities for O&M of distributary and field channels, farmer organizations are to be exempted from payment of any form of service fee or water tax to the government. One of the programs that focusses on the implementation of the participatory management policy is the Integrated Management of Major irrigation Schemes (INMAS), which was created 1984 to coordinate the services the various government agencies provide to farmers, as well as to promote farmer participation in O&M within 35 major schemes. The most important tools to achieve these are the Distributary Canal Organizations (DCOs) and the Joint Management Committees through which officials and farmers jointly plan and manage irrigation O&M. INMAS is managed by the Irrigation Management Division (IMD).

Kaudulla Irrigation Scheme

With its official registered command area of 5,088 hectares (ha), Kaudulla is one of the largest tank fed schemes that comes under the INMAS program. Although the tank has a storage capacity of about 122 million cubic meters (Mm^3), which is a quite generous amount for its command area by Sri Lankan or by international standards (Abernethy, 1985), occasionally water shortage occurs in the *dry* Yala season, primarily owing to the dramatic increase in encroachment' and illicit tapping of water to irrigate highlands. The approximate mean annual rainfall is 1,300 mm. Paddy is the main crop in both the wet Maha season and the Yala season. The tank, which occasionally also receives water from the Mahaweli Ganga System, feeds two main canals from which a number of Distributary Canals (DCs) and a small number of Field Channels (FCs) take water by means of fully adjustable disc gates. The scheme is divided into 23 hydrological units ('tracts') that vary greatly in size (80 to 260 ha). Each tract has one or more distributary canals, from which a number of field channels take water to the 10 to 25 field inlets per field channel. A major part of the main system infrastructure, as well as most of the distributary canals and field channels, are unlined.

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[2] Some unofficial sources report that the actual irrigated area must he over 7,000 ha

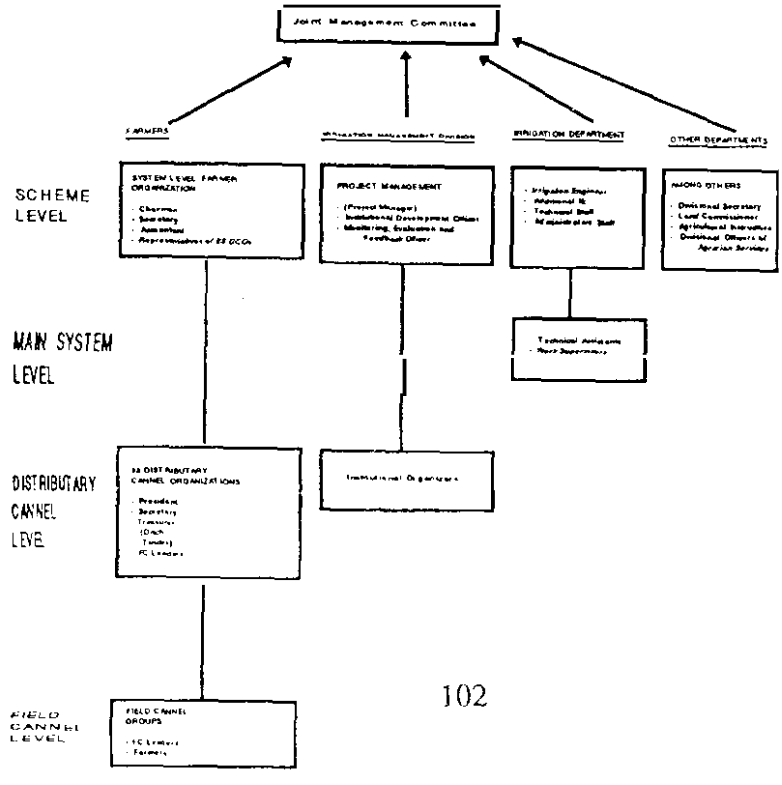
Kaudulla is located in the *dry* North **Central** Province. It is part of a resettlement project that was rehabilitated and expanded **in** the late 1950s to allot land to resettlers from the wet zone in the south. Allottees were given approximately one hectare of paddy land and 0.4 ha of highland for homesteads.

Institutional Structure

One of the main tasks of the INMAS project manager was to establish farmer organizations, the so called Distributary Canal Organizations (DCOs) in each of the 23 tracts. Twenty-six institutional organizers were employed to help to organize the DCOs. The initial idea of creating DCOs was to gradually turnover O&M responsibilities to them. Each DCO has a president, a secretary and a treasurer who *are* elected in the annual general meeting. The responsibility of these office bearers includes calling monthly DCO meetings, organizing *shramadana* (collective **free** labor) for cleaning, and maintaining contacts with banks and agencies, particularly with the Irrigation Management Division and the Irrigation Department. Elected FC leaders are responsible for organizing O&M at the field channel level, as well as for reporting problems of water users to the monthly DCO meetings and to the DCO office bearers.

A key element in the INMAS approach is the creation of Joint Management Committees at scheme level. In addition to the project manager (who coordinates the joint activities and presides the monthly meetings) and his staff, the presidents of all ***23*** DCOs, as well as representatives of the Irrigation Department, the Department of Agriculture, the Department of Agrarian Services and a number of other departments participate in the Committee. Occasionally, representatives of banks, cooperatives or marketing boards *are* invited to attend a meeting. 'Figure 1 gives an overview of the institutional setup of the Kaudulla Irrigation Scheme.

Figure 1. institutional setup, Kaudulla Irrigation ***Scheme,*** *1994*



Notes:
* Currently the IDO is the Project Manager In Charge

PARTICIPATORY MANAGEMENT PERFORMANCE ACHIEVEMENTS

In this section the achievements of the participatory management program in Kaudulla are evaluated according to the two official policy goals, which are:

1. Increasing the share of O&M expenditure borne by the farmers by transferring a large portion of the O&M responsibilities to them. This would help relieve pressure on the government budget;
2. Improvement of the productivity of the irrigation schemes through improved farmer ability to manage the system to serve crop needs (IIMI 1993).

Four general indicators will be used here to evaluate the achievements (cf. Perera 1986):

1. Institutional development as an overall tool, both to coordinate inputs and services and to be able to transfer some of the O&M responsibilities to the farmers;
2. Harmonization of the various inputs and services necessary for increasing agricultural productivity, with special focus on the delivery of imgation water;
3. Reduction in the Irrigation Department's O&M expenditures;
4. Participation of DCOs in O&M management decisions and activities at and below the distributary canal level, as well as increasing the DCOs degree of management capability.

Institutional Development

In Sri Lanka, participatory management in irrigation has been mainly confined to the establishment of farmer organizations and joint management committees. A recent reconnaissance survey shows that farmer organizations have been established in almost all schemes (IIMI, 1993). Kaudulla fanners and officers have repeatedly reported that the major achievement of the INMAS approach is that it has helped to narrow the gap between them. One can observe that project management staff work closely with other agencies as well as farmers. With the termination of funding of the INMAS Program coming up soon the number of Institutional Organizers has dropped from 26 in 1991 to 5 in 1994. The Institutional Development Officer became the Project Manager in charge after the Project Manager himself resigned.

System-Level Farmers' Organization and the Joint Management Committee

Kaudulla is one of the first schemes in which farmers, with a major support from the project manager and his staff, succeeded in federating the DCOs into a system-level farmers' organization. This organization not only serves the DCOs, but is very active in the Joint Management Committee as well. Already, after a few years, this system-level farmers' organization has become so active and effective in coping not only with irrigation related issues, but with marketing and input supply activities, that it has been able to take over the chair of the Joint Management Committee from the IMD Project Management.

Although it is reported that there have always been difficulties in getting all committee members committed to take up joint management activities, the Joint Management Committee in Kaudulla has become well known for its success in bringing the various parties together to discuss issues of mutual interest that go far beyond those related to O&M responsibilities. From previous minutes and from observations of the meetings over the last two seasons (1993-94), it has been observed that at least 15 out of the 23 DCOs send their representatives to the monthly Joint Management Committee meetings.

The Establishment of Distributary Canal Organizations

In Kaudulla, the turnover of O&M to DCOs has been a gradual process comprising the following steps:

1985-1989:	establishment of DCOs, and giving some DCOs maintenance contracts
1989:	turnover of DC maintenance responsibilities to 7 DCOs
1990:	turnover of DC maintenance responsibilities to all DCOs, and giving some DCOs rehabilitation contracts
1992-1993:	full turnover of DC O&M responsibilities to 6 DCOs
1994:	full turnover of DC O&M responsibilities to all DCOs, and giving DCOs operation contracts as well
Future:	termination of O&M contracts: DCOs become fully independent financially

Kaudulla is certainly not one of those schemes where 'participatory management' is a mere paper exercise. This is not the place to fully evaluate the performances of the DCOs, but in short, observations and previous DCO minutes indicate that the elected office bearers are committed and try to fulfil their responsibilities to develop the DCOs. Most farmers are DCO members, who are aware of the existence and the objectives of the DCOs, and who have been involved in one or more of the DCOs activities, for instance by attending DCO meetings, electing FC-leaders or by participating in *shramadana* work organized by the DCOs.

COORDINATION OF WATER DELIVERY, SERVICES AND INPUTS

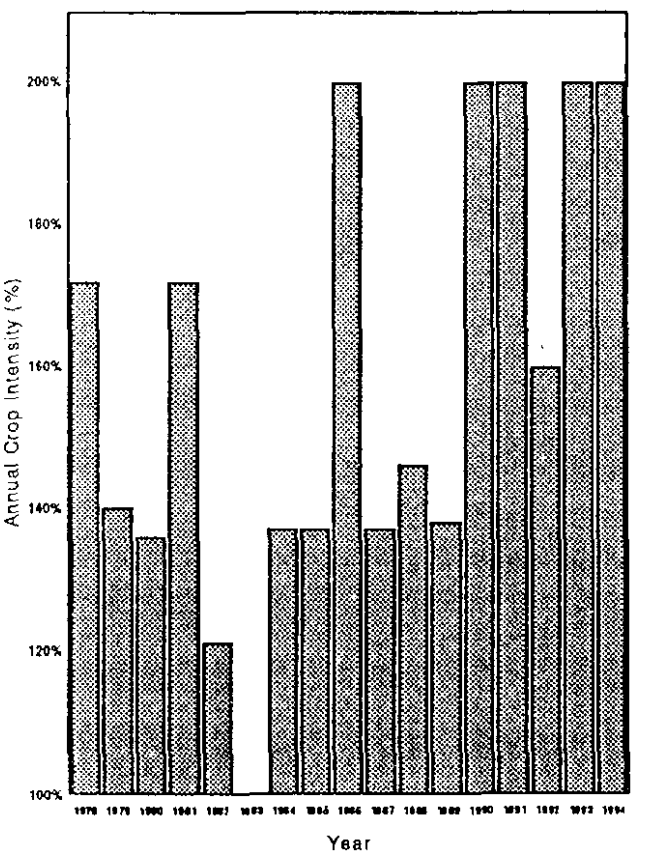
Water Delivery and Crop Intensity

One of the tasks of the Joint Management Committee is to serve as a host to the Divisional Secretary to chair the Cultivation Meeting in which seasonal planning decisions are to be jointly made by farmers and officers[3]. The Joint Management Committee plays a very active role in planning the first water delivery to the system. While the irrigation engineer presents relevant hydrological data, the committee decides on when to start the season and what extent of the command area will be irrigated. Saving irrigation water for the next season by proper tank management has become one of the farmers' major concerns in this decision process.

[3] The new amendments transfer the power to make these decisions to the Joint Management Committee.

Normally the Irrigation Department recommends that the farmers cultivate only 50% of the command area during the dry Yala season: farmers from head-end areas allow tail-end farmers to cultivate half of their fields so every farmer will be able to grow approximately 0.4 ha of paddy. This is the so called *bethma* share system (Spiertz 1992). One of the first achievements of both the project management and the system-level farmer organization was to encourage the Joint Management Committee to shift away from the *bethma* system, to cultivating the full command area, especially in years when there is relatively abundant water in the tank at the beginning of the Yala season. This has resulted in an increase in annual crop intensity from less than 150% before 1990 (except in 1986) to 200% in **4** out of the 5 years after 1990 (Figure 2). This is a substantial improvement considering the fact that at the same time the tank duties of both the Maha and the Yala seasons slightly declined (Figure 3)[4].

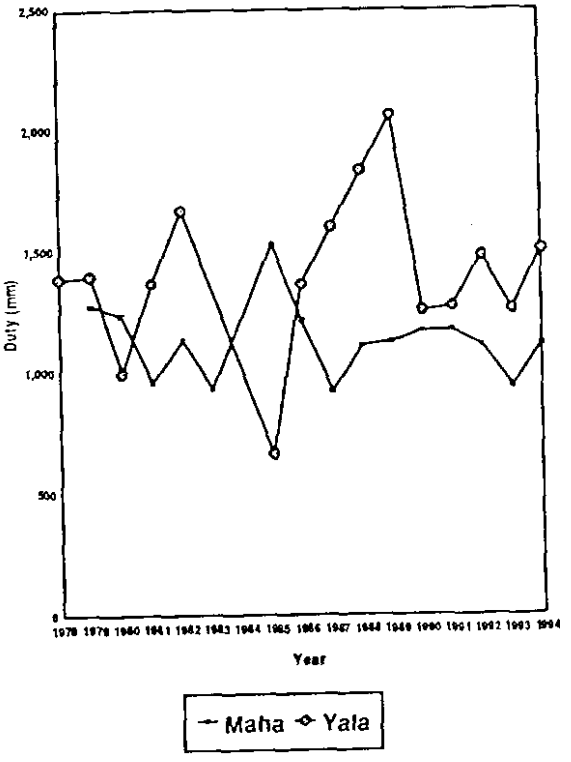
Figure 2. *Annual crop intensity, Kaudulla Irrigation* ***Scheme,*** *1978-1994*



Source: 1978-1982 date are computed from Abemethy, 1985; 1983 data are not available; 1984-1994 data are collected from **the** Office of the Irrigation Engineer.

[4] Here the official cropped area (excluding encroached area) is used to calculate the tank duties of both seasons. The actual **tank** duty will be even lower owing to the increase in encroached area over the last few years.

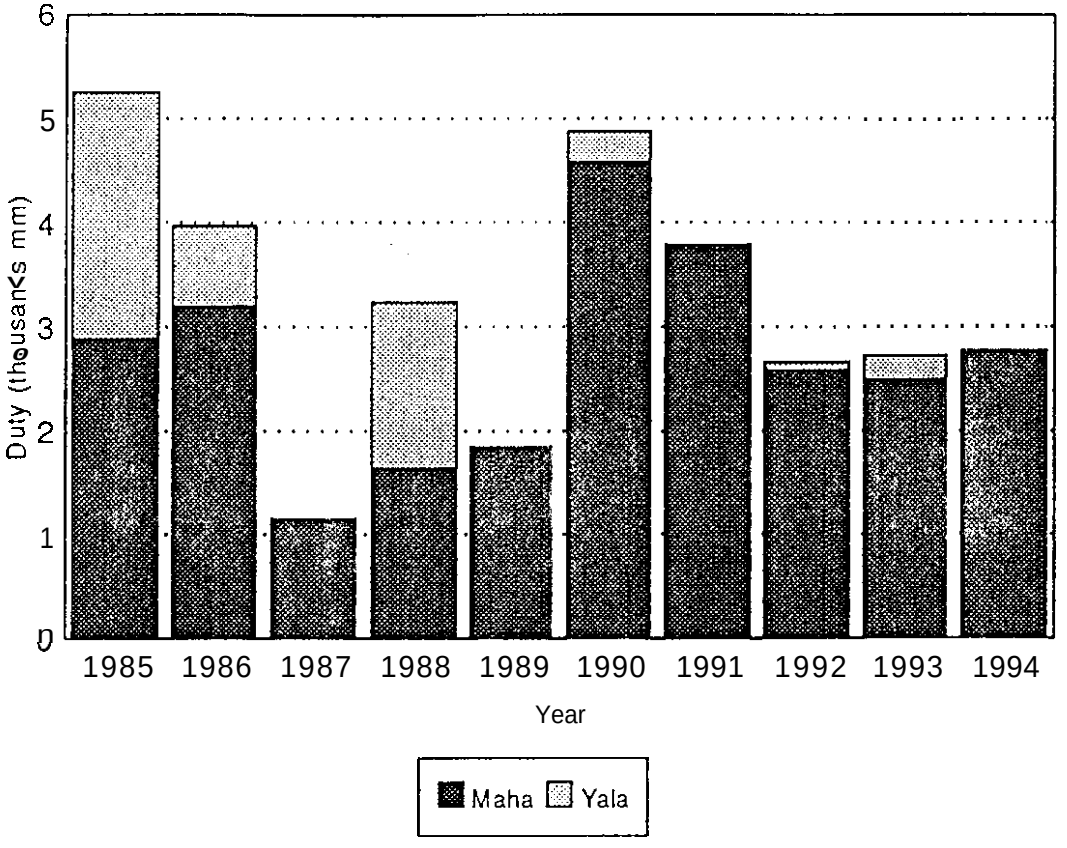
Figure 3. *Kaudulla Irrigation Scheme tank duties, 1978-1994.*



Source: 1978-1982 date are computed from Abernethy, 1985; 1984 data are not available; 1985-1994 data are collected from the Office of the Irrigation Engineer.

The following example illustrates that the system-level farmer organization has become a strong institution that is able to enforce the decision to grow the full command area during Yala. **As** the beginning of the Yala **1993** was **very** *dry* the irrigation engineer had advised the seasonal planning meeting to follow the *bethma* system. However, the system-level farmer organization disregarded this advice and argued that they should try to get additional water from the Mahaweli Ganga System in order to cultivate the **full** command **area.** The system-level farmer organization was prepared to take full responsibility **for** any crop failure that might occur, Through the help of both the district organizer of the ruling party and a local Member ***of*** Parliament, the system-level farmer organization approached *the* Director of the Water Panel in Colombo and even the President of **Sri** Lanka. The President ordered by facsimile to allocate an extra 12 Mm^3 from the Mahaweli Ganga System to Kaudulla tank. Owing to severe drought only 3.7 Mm^3 could be allocated at *the* start of the season, but **as** in previous **years** farmers again succeeded in cultivating the full command area during Yala season and achieved a 200% crop intensity in 1993. Figure **4** shows the extra water inflow from the Mahaweli system into Kaudulla tank (in mm per cropped area). Comparing Figure **4** with Figure 2 learns that *only* in a few cases the increase in crop intensity can be explained by the extra water inflow from the Mahaweli system.

Figure 4. *Extra inflow to Kaudulla tank from the Mahaweli system. 1985-1994 (in duty per cropped urea).*



Source: Office of the Irrigation Engineer.

Agricultural Input Supply

The official idea behind the Joint Management Committees was to coordinate inputs and services that are provided by the various departments. One of the major complaints by both farmers and the project management is the low participation of some of the key departments that deal with the supply of important agricultural, legal and administrative services. Despite this the Joint Management Committee helped the system-level farmer organization as well as some DCOs get access to government services, such as for instance the Department of Agrarian Services which provides subsidized two-wheel tractors and seed paddy. In order to compensate the agencies' relatively small role in the supply of agricultural services, as well as to compete actively with locai private traders, the organization made the supply of cheap services to improve the farmers' living conditions as their main objective, for which they developed an number of service oriented activities.

One of the organization's key activities is to supply fertilizers, agro-chemicals and seed paddy at discounted bulk *rates,* which was started in 1991. Profits from these activities are used to invest in further expanding the services to the farmers. Although data on sales are available only from 1992 onwards, Table 1 suggests that there has been some seasonal differentiation in the amount of inputs sold by the system-level farmer organization[5]. One of the major reasons for this is the difficulty the organization has to buy the inputs from the agents well before the season starts. By the time the inputs get to the organizations' shop many farmers started buying inputs from private *traders.* The organization sells fertilizers at prices that are at least 5% below the local market prices. They see this as their major service towards the farmers, regardless of threats the office bearers get from local traders. Owing to severe floods during the Maha 1993-94 season the fertilizer sales dropped. Profit is mainly made on agro-chemicals and seed-paddy. Profits on fertilizers is low owing to the high transport cost involved in hiring a lorry. Other costs include the maintenance of a shop and an office, an accountant and a small salary for the chairman. In spite of the organization's ability *to* keep a steady positive balance of more than Rs. 100,000 (US$ 2,100) over the last two years, access to capital is seen as the most important constraint to further expansion of the sales.

Table 1. Input sales by the Kaudulla System-level farmers' organization, 1992-1994

	1992-1993 Maha	1993 Yala	1993-1994 Maha	1994 Yala
Fertilizer sales (number of bags)	3816	5760	2600	3266
Agro-Chemical Sales (x 1,000 Rs.)	293	676	426	344

Sour-ce: System-level farmers' organization, Kaudulla

Reducing the Agency's O&M Expenditure

In Sri Lanka actual operation and maintenance expenditures are determined and allocated by higher authorities rather than by real requirements and the possibility of recovering recurrent costs from the farmers. Operation and maintenance budget requirements are first submitted to higher management levels, then to the Ministry, and finally to the Treasury. The submitted estimated requirements are then adjusted due to budgetary constraints. Consequently, the final allocations by the Treasury are much less than expected. Allocations can be adjusted throughout the year. As a consequence irrigation system managers cannot be certain what the eventual annual operation and maintenance allocation will be, which makes local operation and maintenance decision making very

[5] These are the official figures of the farmer organization. It is likely that they are somewhat underestimated.

difficult. **A** TEAMS study on operation and maintenance costs of five major schemes clearly demonstrates that a centralized allocation of funds results in unrealistic budget estimates and inefficient operation and maintenance programs. Also it does not sufficiently encourage system managers to identify and prioritize items of maintenance work, nor does it provide incentives to prepare a performance oriented program of operation and maintenance activities, in physical and financial terms **(TEAMS,** 1991).

By turning over some O&M responsibilities to DCOs the agency hopes to reduce its own financial contribution to O&M. This can basically mean two things: the agency's contribution to O&M declines in terms of absolute expenditures, or the agency's expenditures remain the same but the quality of O&M increases owing to a higher contribution by farmers. Figure 5 shows that although the annual O&M expenditures in Kaudulla (in constant 1993 prices) have decreased since the start of the INMAS program in 1984, this reduction is not considerable: from 3.4 million rupees (US$ 70,212) in 1984 to 2.9 million rupees (US$ 60,402) in 1993[6]. The actual O&M expenditures per hectare of cropped area have slightly decreased if one considers the increase in crop intensity over the last five years. The expenditures in Figure 5 include regular O&M, as well as priority maintenance and casual maintenance laborers, but exclude the cost of regular agency staff. The expenditure for regular O&M dropped especially from 1985 to 1989. The sudden increase in total O&M expenditures in 1990-1991 is mainly due to charging deferred maintenance of the main system to a so called priority maintenance budget, which contributes about 30% to 50% of the total O&M budget (Table 2). While the expenditure for regular O&M remains at more or less the same level, the budget for priority maintenance has declined, which explains the slight reduction in O&M expenses since 1991. As is shown in Table 2 the total O&M expenses include casual maintenance laborers, the cost of which has also remained at the same level.

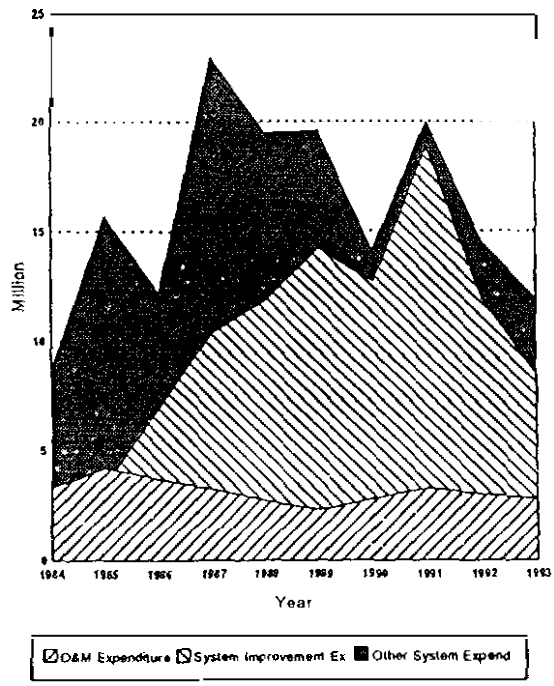
[6] 1 US$ equals Rs. 48 (1993 average rate).

Table 2. Breakdown of O&M expenses, Kaudulla Irrigation Scheme, 1990-1994 (in constant 1993 rupees).

Year	Regular Operation	Regular Maintenance	Priority Maintenance	Maintenance Labourers	Total O&M
1990	284,939 (10.1)	691,902 (24.6)	1,385,298 (49.1)	455,067 (16.2)	2,817,206 (100)
1991	488,382 (14.4)	909,140 (26.7)	1,453,219 (42.8)	545,366 (16.1)	3,396,107 (100)
1992	470,784 (15.3)	963,224 (31.3)	1,100,885 (35.7)	546,239 (17.7)	3,081,132 (100)
1993	432,877 (14.9)	1,059,501 (36.5)	966,955 (33.4)	439,997 (15.2)	2,899,330 (100)
1994 (Allocated)	400,000	900,000	Not yet known	612,000	Not yet known

Note: Number in parentheses are percentage of total O&M.
Source: Office of the Irrigation Engineer, Kaudulla.

Figure 5. O&M, system improvement and other expenditure of Kaudulla Irrigation Scheme, 1983-1993 (in constant 1993 rupees).



Note: Other system expenditure includes *flood* damage **and** emergency repairs, surveys, etc., Other system expenditure in 1985 includes Rs. 6.5m for a major bund repair.
Source: Office of the Irrigation Engineer, Kaudulla.

Although officially the DCOs have taken over O&M responsibilities at and below the distributary canal level, this has had little implications for the actual O&M expenditures at the system level. It is difficult to assess to what extent this is due to under allocation of the O&M budget. The irrigation engineer claims that he still faces an under-allocation for total O&M[7]. Furthermore, throughout the year it remains uncertain what the eventual O&M budget will be. The 1994 budget has already been changed twice and in June 1994 the engineer was told to further cut his budget with another 20%. This example not only suggests that the actual O&M expenditure is determined by an allocation from above rather than by real O&M requirements, it also shows that irrigation system managers are not financially independent from their headquarters, which makes local O&M decision making very difficult. The engineer uses two strategies to cope with this under-allocation and uncertainty. Some of the regular O&M work to be done is covered by funds under a rehabilitation program that started in 1986-87 (Figure 5). The other strategy is to reduce the quality of the work to be done, for instance by desilting the main canal only once instead of twice a year.

Comparing Kaudulla with other schemes might give us an indication of the actual level of O&M expenditure in Kaudulla. Fernando (1993) reports on 4 different studies in which attempts have been made to quantify irrigation O&M target and actual expenditures in Sri Lanka. One study concludes that a typical O&M allocation for a major irrigation scheme is about Rs. 380 (US$ 7.9), whereas the actual O&M requirement was found to be between Rs. 1,325 (US$ 27.6) and Rs. 1,800 (US$ 37.5) per ha as an average for both the main system and the lower system levels (all in 1993 prices). Based on a study in 12 DCOs, the actual O&M cost of the DCO area was found to be about Rs. 212 (US$ 4.4) per ha. In Kaudulla the regular O&M expenditure per hectare in 1993 was Rs. 293 (US$ 6.1), which is lower than the average found by Fernando, assuming that his data only include regular O&M. The total O&M expenditure (without regular staff salary) is Rs. 570 (US$ 11.9) per hectare if one includes priority maintenance and casual maintenance laborers. This is higher than the Rs. 380 found by Fernando, but still lower than his estimated requirement.

Establishing Distributary Canal Organizations and Improving O&M

Although the collection of quantitative data to assess O&M performances has not yet been completed in this study, qualitative documentation of O&M activities suggests that the aimed improvement of O&M at the distributary canal level has not yet been fully achieved. The following examples, which are derived from one DCO in the middle reach of the system, support this observation.

Before official turnover of maintenance fanners used to clean the distributary canal and field channels. Cleaning of both the distributary canal and the field channels through *shramadana* has only slightly improved in terms of number of labor days. Farmers are generally not willing to voluntarily contribute labor for maintenance work that goes beyond regular cleaning, such as earth work to repair a bund.

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[7] The estimated 1994 O&M budget submitted by the Irrigation Engineer is 2.15 times higher than the actual allocated budget

Before turnover water distribution was organized by the *Vel Vidana*, a traditional local irrigation officer who was generally accountable to the water users. Now water distribution is the responsibility of the DCO at the distributary canal level and the FC-leaders at the FC-level. Although some DCOs have appointed a *Yala Palaka* (a ditch tender), other DCOs do not want to invest in such a person but rather try to operate the distributary canal with the help of the DC and the FC leaders. In the DCO monitored for this study this has resulted in an ad hoc operation of the FC-gates, because these leaders are generally not able to implement a set rotation schedule. At the field channel level farmers report that there has been no change in the way water is distributed before and after turnover,

Almost all FC-leaders complain that they get little participation from the water users along their field channels. It is hard to motivate farmers to contribute to *shramadana*, and the leaders lack the authority and legal support to have farmers follow the rotation schedule they have agreed upon. Some fanners are suggesting *there* should be a return to the *Vel Vidanes* who, unlike the present FC-leaders, were paid a share of the harvest. This was an incentive for them to be accountable for the way they operated the system below the distributary canal level.

In summary, the participatory management program implemented in Kaudulla irrigation scheme has not yet fully realized its official objectives. However, other unanticipated positive results have occurred, particularly through the system-level farmer organization. The system-level farmer organization has been effective in developing agricultural input services to the farmers, as well as in making decisions on seasonal water allocation at the system level. On the other hand, the turnover of O&M responsibilities to DCOs until now has had only a marginal effect on the reduction of the irrigation agency's O&M expenditures. Although most farmers are enthusiastic about the DCOs, as well as the system-level fanner organization, there has not yet been a strong incentive for farmers to take over O&M. Why is this? Below I argue that one of the reasons is the way farmer organizations at different levels, as well *are* farmer organizations and agencies are financially related with each other. It is argued herein that these financial relationships do not provide sufficient incentives to DCOs to actually feel responsible for O&M at the distributary canal level.

FINANCIAL ARRANGEMENTS AT THE DISTRIBUTARY CANAL LEVEL

A key issue for turnover is the way in which farmer organizations try to become both financially viable and financially independent from agency support. The financial viability of DCOs in Kaudulla Irrigation System is greatly determined by the way these organizations are financially related to both the system-level fanner organization and the irrigation agency.

DCOs' Income-Generating Activities

As with the system-level farmer organization, provision of agricultural services to fanners is the main priority of the DCOs. Although farmers know that improvement of O&M is one of the official goals of the turnover policy, interviews with DCO-leaders and water users indicate that only few of them see better water distribution and *shramadana* for canal cleaning as priorities. DCOs in Kaudulla have developed the following services to their members:

* hiring out two wheel tractors to farmers at prices below the market price. These tractors could be bought at subsidized prices against favorable interest rates and instalment arrangements;
* bulk purchase of fertilizers, agro-chemicals and seed paddy below market prices. The DCOs buy these inputs either through the system-level farmer organization, or directly from wholesalers and cooperatives;
* bulk storing and marketing of paddy at prices that are higher than those paid by local traders and middlemen. This marketing takes place either through the government Paddy Marketing Board, or directly to traders;
* taking over system rehabilitation contracts from the Irrigation Department for essential structural improvement. 5% of the contract value must be deposited in the DCO fund;
* in addition to the above activities, DCO-leaders negotiate favorable conditions for DCO loans with banks and some agencies.

These activities help organizations to build up funds. Taking over rehabilitation contracts used to be the main source of income for DCOs in the early 1990s. At present DCOs *make* most profit from hiring out tractors and paddy marketing. Table **3** shows the increase the kind and the level of services provided by one sample DCO with 300 members. Owing to lack of sufficient capital they had to cease their sales of fertilizers and ago-chemicals. The table also shows the dramatic increase in the organization's involvement in paddy marketing.

Table 3. Provision of inputs and services by as sample Distributary Coital Organizations with 300 members. 1991-1994.

	1991-92 Maha	1992 Yala	1992-93 Maha	1993 Yala	1993-94 Maha	1994 Yala
Fertilizers and Chemicals sold (x Rs. 1,000)	13	110	n.a.	276	111	no sale
Paddy Marketing (x 1,000 kg)		**1.51**	**70.9**	36.4	232.4	298.5
Number of farmers that hired DCO tractor	10.2				21	18

Source: DCO accounts

The lack of paddy storing capacity and transport facilities prevent the DCO from earning a higher income from paddy marketing. Most farmers strongly support these activities, because they personally benefit from the better prices and they acknowledge the importance of these activities

for making the DCO financially sound. However, not all farmers are interested or able to benefit *from* these services. A considerable group of farmers still take inputs from private traders as they have a long term indebtedness relationship with these traders, which has proved to be hard to escape from. Although the prices farmers pay to traders are higher than the prices they would have to pay *to* farmer organization, traders are willing to supply inputs on a loan basis, something which the farmer organization cannot do. But it is exactly the repayment of this loan that makes the relationship going. Another group of farmers has illegally rented or mortgaged in land from official settler?. As this is only for one or a few seasons at the most, these farmers hardly developed commercial relationships with the farmer organizations. These "sideline" sources of income are not invested in improvements in O&M. The organization uses these earnings to build up a revolving fund to be able to purchase more inputs or to construct a paddy store.

Relationship between the DCOs and the System-Level Farmers' Organization

There is a close financial relationship between the DCOs and the system-level farmer organization. In order to be able to build up sufficient funds to purchase agricultural inputs, the system-level farmer organization requests DCOs to deposit an average amount of Rs. 10,000 (US$ 208) per DCO, to be repaid with 5% interest. So a considerable part of the profits made by DCOs is invested in the system-level farmer organization, which is not involved in O&M below the distributary canal. However, this relationship has already created several problems that might endanger the financial sustainability of the system-level fanner organization. As the DCO is investing this amount in the system-level farmer organization they expect a real improvement in the provision and cost of inputs. Owing to transport problems and lack of capital the system-level farmer organizations have always had difficulties in distributing inputs on time. This has caused some DCOs to develop their own channels for providing inputs, or in some cases to return to the local traders. As a Consequence such DCOs have lost the incentive to further invest in the system-level fanner organization and have terminated their financial contribution to the system-level farmer organization. This has jeopardized the existence of the system-level farmer organization since it depends on the financial support of the DCOs[9].

DCOs and System Rehabilitation Contracts

A USAID-funded Irrigation System Management Project was started in Kaudulla in 1986. It included rehabilitation and the improvement of irrigation structures in distributary and field channels. The annual budgets for these works in Kaudulla differ per year, but range from Rs. 5.6M (US$ 117,000) in 1993 to Rs. 15.5M (US$ 322,000) in 1991 (in 1993 prices, *see* Figure 4). In this project DCOs were given priority to undertake contracts for rehabilitation work in their respective distributary areas at estimated rates. An advance of 20% of the value of the contract is paid to the

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[8] Although official settlers get a life-time lease contract from the government. the ownership of the land remains with the state.

[9] Thesystem level farmer organization is not officially registered under section SOA of the Agrarian Service Act, No. 4 of 1991, which *makes* it very difficult for them get access to bank loans.

DCO prior to the work (Fernando **1993).** Each DCO is allowed to take over contracts up to an amount of Rs. 750,000 **(US$** 15,625). In Kaudulla DCOs have agreed to deposit 5 percent of the value of the contract into DCOs fund to help them to build up their financial capacity.

Also a sample DCO took over many contracts and was able to make money out of this as well. However, in terms of financial management and incentives many problems have occurred (in addition to some problems with the quality of the work done, which is not elaborated on here). In some cases there is a broad gap between the time the technical assistant made the estimate and the moment the final payment was made. With rapid inflation of wages and costs for materials DCOs have found it difficult to complete the work within estimated costs. It has also been reported that some DCOs could not repay the contract advances after eventually deciding to not to take the contract. Except for farmers hired as laborers, farmers are not involved in contributing or supervising the work. Only in a few cases were fanners prepared to fulfil the agreement between the Irrigation Department and the DCO *to* contribute voluntary labor to do the necessary earthwork for rehabilitation works in the FC. DCO-leaders and FC-leaders repeatedly stated that the only reason to take a contract is to be able to earn an additional income, rather than being interested in improving **the** system. Taking over contracts has helped some DCOs to increase their income, but it has not been an incentive to farmers to increase their commitment to future maintenance and repairs. Rather than using the income for O&M, the DCO uses the money to develop other agricultural support services.

DCOs and O&M Contracts

In addition to the rehabilitation contracts described above the Irrigation Department pays the DCO a small sum apportioned for maintenance of the distributary canal, and since the official turnover of operation in 1994, for operation activities as well. In 1992 and 1993, 20% and 33% respectively of the system's regular maintenance budgets were allocated to DCOs for maintenance contracts. In 1994 about 30% of both the regular maintenance and the regular operation budget is allocated **to** DCOs. This amount averages Rs. 80 (US$ 1.7) per hectare. The idea behind handing over O&M contracts to DCOs is to motivate fanners to carry out the work. It is hoped that DCOs will carry out weeding, cleaning and desilting through voluntary labor and that the contract funds will be **used** to provide tea to the farmers who do the work, and if necessary to buy some materials. From **1994** onwards the funds can also be used to appoint a ditch tender. The Irrigation Departments regards these payments as incentives for DCOs to get them more actively involved in O&M. This is why they only pay Rs. 80 per hectare, which is approximately one third *of* the estimated required amount for O&M of the distributary. However, as described in the previous section of this paper, this has not proved to be an adequate incentive to invest in improving O&M. In a sample DCO farmers reported that they have not been participating for distributary canal cleaning for two years because they assume that the O&M funds paid to the DCO is sufficient to hire contract laborers, which would, as they argue, exempt them from contributing their labor. However, most DCOs do not use the money for canal maintenance. In most cases it has been observed that the funds are used for other DCO activities. In one case, DCO leaders intend to use the operation allocation to hire a bus for a religious tour around the island.

Awarding contracts is not a problem as long as there is a clear and consistent relationship between this kind of financial support and the level of farmers contribution. However, in the case of the contracts this is not the case.

Water Tax and Membership Fees

Small and Carruthers (1991) argue that irrigation agencies should rely more on operation and maintenance cost recovery from the farmers in order to make these agencies more accountable for the services they provide. This does not necessary imply that allocations from the central government or Treasury should cease altogether. They can continue, albeit at a declining proportion of total cost. Allocations should also be made in terms of both real .operation and maintenance requirements and the agencies' efforts to collect fees from the fanners.

Efforts in the early 1980s to establish a user fee in Sri Lanka failed, partly because there was inconsistency between the project level specific earmarking of fees and the project-specific agreements about the government's portion of operation and maintenance budget. Political unrest in the late 1980s made fee collection all together impossible. At present paying water taxes is still subject to political discussion and propaganda (as the introduction of this paper makes clear), with the result that very few farmers pay these taxes. The highest recorded amount of water taxes paid in Kaudulla was in 1987 when a little over Rs. 260,000 (Rs. 53 per hectare, or Rs. 64 per farmer) was collected. Since then the payment has declined dramatically to almost nil after 1991.

The May 1994 Amendments to the Irrigation Bill now legally exempt farmers from paying water taxes to the government if they take over O&M responsibilities. They give DCOs the right to collect fees from the water users, which they can use within their own organization. In fact, DCOs have been collecting these fees already for a number of years. DCOs in Kaudulla expect each members to pay Rs. 100 *per* successful crop. A survey done in one DCO founds that after the inception of the DCO, members paid these fees for only 2 to *3* seasons. Over the last few seasons the DCO collected fees from only a few farmers. DCO leaders reported that they do not have the authority or power to enforce members to pay. Water users complain that paying DCO fees has not resulted in an improvement in water delivery by the DCO. Some farmers reported that they think that paying fees to the DCO would exempt them from contributing to *shramadana* for canal maintenance. Unlike the profits from marketing activities, which directly benefit the farmer, generally farmers have no idea what is done with the fees, nor do they see how to make DCO leaders accountable for using this money in a way that improves water delivery to their fields.

DISCUSSION AND CONCLUSIONS

Some farmers have strategically used the establishment of farmer organizations to improve their access to better and cheaper services, especially in terms of water supply at the system level and provision of agricultural inputs. And with the help of the project management and other agencies farmers have learned to expand these services and build up financially sound farmer organizations. As far as these achievements are concerned, new pillows have eased some of the headaches of a group of fanners that has access to the services of the farmer organization. Without

wanting to disregard these achievements, the question still remains what good participatory management has done to the agencies' objectives. Evaluation of the financial arrangements created at the level of the distributaries by both the irrigation agency and farmers' organizations themselves show that these arrangements have failed to become powerful incentives for significantly reducing O&M costs and improving O&M. Although the widespread concern among agency staff about the effectiveness of participatory management in Sri Lanka should be taken seriously, one should be slow in blaming it all on the farmers' involvement in local resource management. The basic conclusion of this paper is that it is not fair to attribute the disappointing results in system management to the fact that some of the management responsibilities have been handed over to farmer organizations. The main reason for this conclusion is that participatory management has only partially been implemented. A mere handing over of responsibilities is not sufficient to make farmer leaders and agency staff accountable for their financial share of the responsibilities. Far more dramatic financial and institutional changes in the way imgation is financed is required to make participatory management useful not only for some farmer organizations but for the agencies as well. The discussion on the conditions for these institutional changes can be framed around the following four questions:

1. Who is Financially Responsible for What?

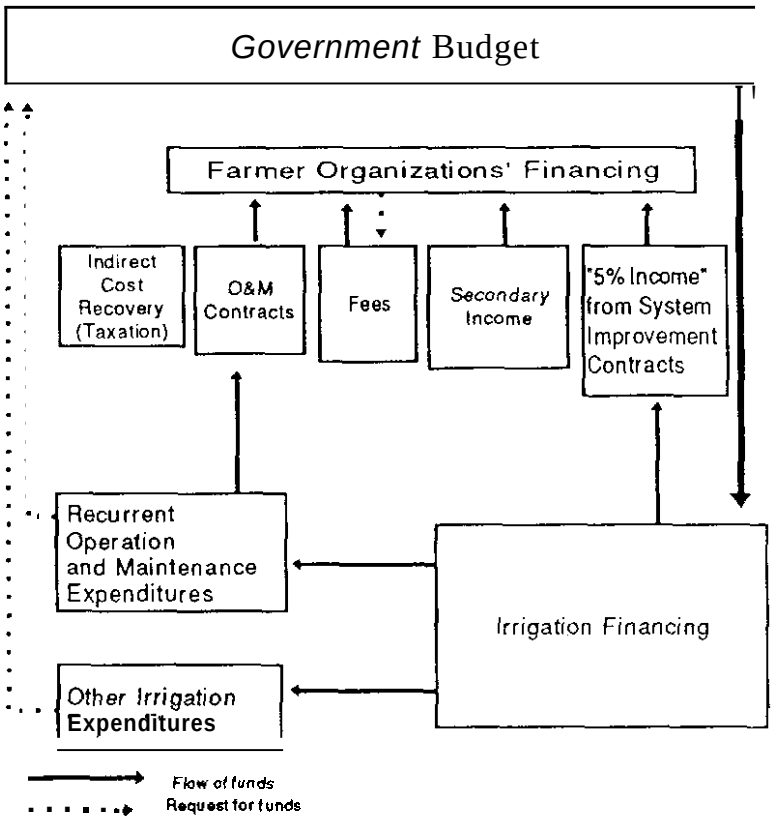
   Participatory management programs focus too much on sharing *activities*, without making clear who is financially responsible for these activities and who can be made financially accountable if these activities do not take place. The key to sharing financial responsibilities is clarity, from the sides of both the agencies and farmer organizations. Both agency staff and farmers do not really know what they are up to in the'near future. Project managers and engineers receive instructions from their headquarters to stop handing over O&M contracts to a DCOs, but still the payments continue. Farmers *are* not intercstcd in investing their DCO income in O&M activities because experience has shown them that the agency continues to provide O&M contracts to DCOs. There is a lot of uncertainty about the continuation of the O&M contracts. And farmer leader do not sufficiently make clear what the fees they are collecting from the farmers are used for.

2. Is the Government Sufficiently Equipped Institutionally to Share Financial Responsibilities with Farmers?

   Figure 6 illustrates that in Sri Lanka the only source of financing irrigation is the central government budget. The irrigation agency's budget is completely dependent on annual allocations from the central government. Allocations are neither decided in terms of actual requirements, nor by the level of irrigation cost recovery. Managers of irrigation systems are financially not dependent on the way they locally mobilize resources. The agency's intention to motivate farmers to manage O&M by involving them in contracts has proven to be counterproductive. Likewise, handing over the rehabilitation contracts apparently has not sufficiently motivated farmers to take over full management of O&M. These 'incentives' preserve the existing relationships between farmers and the agency, in which the former are financially dependent on the latter. However, without giving farmers proper tools to make

both agencies and farmer organizations more accountable for their O&M responsibilities.

Figure 6. Flow of funds in Sri Lankan irrigation financing and farmer organizations: central government allocations and financial support to farmer organizations are not linked to direct cost-recovery (central financing).



Source: Adapted from Small and Carruthers, 1991:50.

3. Can Farmers Take Over Financial Responsibility?

The current policy assumes that turning over financial responsibility to farmers will increase the financial accountability of O&M and consequently improves it. But the question whether farmers can carry the financial burden remains. The major argument of agency staff not to abolish direct or indirect subsidies, and consequently not to establish accountability mechanisms, is that farmers are too poor to contribute financially. And indeed, an agricultural income survey done among 20 households in Kaudulla shows that on an average farmers had a net loss of Rs. 1,100 from their Maha 1993-94 paddy production[10], whereas they had a marginal net income of Rs. 7,300 from their Yala 1994 paddy production.

[10] This is partly because of the low yields owing to severe floods during the Maha season

However, should the popular notion of politicians and government staff that farmers are *individually* unable to pay for some of the costs involved in system management not be replaced by the question whether multiple functional *former organizations* can be made financially responsible. Many scholars and policy makers argue that water users organizations should not take on commercial activities as this might distract them from their operation and maintenance responsibilities. However, in practice these organizations are highly interested in providing services and agricultural inputs, and their is no way or rational that would prevent the organizations from doing so. Although up to now many fanner organizations have not been able to become financially independent of direct or indirect government subsidies, some organizations have shown that farmer organizations have the potential to become financial viable.

The fact that farmers strategically use their organizations for purposes other than improving O&M brings us to the question on the definition of farmer organization in participatory management. The Kaudulla case shows that farmer define the role of their organizations more (and predominantly) in terms of providing agricultural services to their members than in terms of O&M improvement. Policy makers and agency still *see* farmer organizations merely as a means to improve O&M, regardless whether these organizations are at all interested in contributing to such improvements. The observation that fanner use their organizations for other activities than O&M should have implications for participatory management policies in general and for the role that is defined for the various supporting agencies. The question is arising as to whether the approach of the participatory management programs to concentrate on farmers' organizations taking over O&M responsibilities is the right one. If farmers are mainly interested in developing capacities other than O&M, then why should the Irrigation Department need to provide financial support to farmers? And should not the government support the tendency of the fanner organizations to develop multiple functions? The Kaudulla case suggests that multi-functional organizations has greater potential to provide more incentives to farmers to work together and make their organizations financially viable. The next step then would be to see whether these financially sound organizations can provide an important contribution to O&M improvement.

4. Is there **sufficient** legal foundation **for** participatory management?

One of the major problems in Sri Lankan participatory management policies is that the concepts of participatory managements and the vesting of irrigation management responsibilities are not defined precisely enough. Handing over some management responsibilities does not remove the ultimate control of the government over resources. Both land rights and the ownership of the physical works remain with the government. Farmer organizations, as well as farmers representatives in the project management committees have to take on duties and responsibilities, but they do not get the necessary rights and the authority in return. Without these rights and authority farmers will have little *de facto* control over resources and funds. Under these circumstances fanners might find it difficult to enforce a system in which both farmer leaders and agency staff can be made accountable

for the way they mobilize funds and resources for the improvement of system management. Participatory management processes will not create effective property rights to land, water and physical **works.** Legal provisions to share rights and authority should be a precondition for, not the outcome of, participatory management[11]. Unfortunately neither the act under which farmer organizations are registered[12], nor the new amendments to the Irrigation Ordinance provide these rights.

Acknowledgements

The author would like to acknowledge Mr. Anuruddha Kankanamge for his assistance in collecting the data; Mr. M.G.S. Gunasekera (IE) and Mr. R.M. Punchibanda (IDO) and their staff in Kaudulla for sharing their ideas and information with us; Margreet Zwarteveen and Douglas Vermillion for their useful comments on the draft of this paper; Jeffrey Brewer and C.M. Wijayaratna for their comments and criticisms on the approach and earlier results of this study. W i l e I am very grateful to them, I **am** of course responsible for the contents of this paper.

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[11] The same argument is made by Seckler (1993) in his discussion on the relationship between the development of water **markets and** property rights.

[12] This is the **Agrarian** Services **Act** 59a

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3.5 Case Study *on* Privatization of Irrigated Agriculture in Sudan

BACKGROUND

In 1991, the Government of Sudan decided to curtail its primary role in the management of the country's irrigation systems and correspondingly increase the role of the private sector and farmer organizations in the management of the irrigated sector. This initiative symbolized a radical shift in policy pursued by successive governments for about three decades during which the State exercised a comprehensive and rigid control over the country's irrigated sector. The change in policy was apparently in response to the mounting economic difficulties encountered by government in the face of hyperinflation, low levels of investment, dwindling foreign exchange earnings, reduced access to international credit and cut-backs in foreign aid.

With the rapid decline of official reserves and the government compelled to curb public expenditure, several state enterprises and service organizations were targeted for privatization. Among the public agencies identified for privatization were the parastatal bodies vested with the responsibility of administering the countries publicly managed irrigation schemes.

In essence, "privatization" of irrigation schemes in Sudan involves the disengagement of State in the provision of support services to the irrigation schemes and turnover this function to the private sector and farmer organizations. However, the government continues to maintain its control over the means of production by retaining the ownership of land and the irrigation facilities, and the possibility of intervening in the input, product and capital markets through the state controlled marketing organizations and financial institutions.

The turnover program got underway in the wheat season of 1991-92 with the transfer of the management of the White Nile Pump Schemes managed by the White Nile Agricultural Services Administration (WNASA) to private sector and farmer organizations. By the end of 1993, some 116 schemes were turned over to farmer organizations and 16 schemes to a private company on an annual contract. The administration of 38 schemes is provisionally vested with WNASA until it is eventually abolished.

OBJECTIVES

The overall objective of the study is carry out a comparative assessment of the three modes of management of the White Nile Pump schemes in Sudan. These are: i) private company management, ii) management by farmer organizations, and iii) management by a government agency (i.e WNASA).

The fundamental premise that underlies the study is that privatization turnover of irrigation

systems cannot be considered as single, uni-dimensional phenomenon but must be viewed in the context of the broader efforts at political and macro-economic adjustments in the country. The study also contends that changes production relations resulting from changes in system management could affect performance outcomes at the scheme and farm levels.

Given the foregoing perspectives, the specific objectives of the study are:

a. Carry out a critical analysis of the political and economic dimensions of privatization and turnover policy in Sudan.
b. Evaluate the performance of three post-turnover management modes in terms of their efficacy in the supply of production inputs, credit, marketing, irrigation and other ancillary services and cost effectiveness.
c. Analyze the changes production relations resulting from the changes in the management systems and their impact on agricultural production and incomes at the farm level.
d. Evaluate the performance of diesel pumping plants under two management modes.

METHODOLOGY

Empirical investigations are focussed at three levels.

First, at the national level where the focus was critical analysis of policy relating to the turnover of irrigation systems, mechanisms for accountability, macro-economic policies and the incentive structures to foster competition and motivate the private sector.

The second level of analysis was focussed at the scheme level where comparative analysis of three management modes i.e parastatal agency, Private Company and Local Government/Farmer Organizations. An assessment was made of their efficiency in the provision of credit, input supplies, marketing, supply of machinery and equipment, cost effectiveness in the provision of services, irrigation management and agricultural production performance. The impact of the changes in system management on production relations in the pump schemes was documented.

The third level of analysis was at the farm level where the impact of the program was assessed on the basis of a farm survey of **155** tenant farmers from **six** schemes: 2 private company managed schemes, 2 WNASA schemes and 2 farmer managed schemes stratified on the basis of the location of their field in the head, middle or tail-end reaches of the irrigation system.

In addition to the above analysis, a study of the performance of diesel pumps was carried out in selected pumping stations in private sector and parastatal managed schemes.

ORGANIZATION OF REPORT

The report begins by highlighting some conceptual issues relating to privatization and turnover of irrigation schemes. This is followed by a review of privatization and turnover policy

in Sudan as they relate to the White Nile pump schemes. The scope of the privatization process and the political and social constraints are analyzed. Next, the changes in scheme management and their effects on production relations at the fann are described. In addition, some preliminary results on the comparative analysis of the performance of the new management modes are presented. Finally, the report highlights the lessons from this case-study for privatization and turnover of irrigation schemes in countries with a similar political and economic environment.

Some Conceptual Issues

The impetus for the privatization and turnover (P&T) of imgation institutions stems from the dominant perception that imgation agencies, like other government bureaucracies, lack the incentives and responsiveness to optimize management performance. Farmers have a direct interest in sustaining the cost efficiency, profitability and physical conditions of irrigation systems (Vermillion, 1992). Other reasons advanced include: cost saving for the public sector, increased allocative efficiency through water markets; improved management of irrigation systems as the collection of user fees would induce management agencies to improve their services to their clients (Small and Carruthers, 1991; Seckler, 1993).

The foregoing perspectives provide a strong economic rationale for P&T of imgation systems. After all, it was the fiscal and budgetary crises which governments encountered as a result of decades of highly interventionist polices that initially propelled the mass movement towards privatization.

Whilst rationalizing privatization programs in terms of the potential economic gains is legitimate and pragmatic, it downplays the motivating power of non-economic factors and their consequences. This aspect merits some elaboration as in most country situations, the turnover of irrigation systems is being implemented within the overall context of macro-economic and political adjustments.

It is noteworthy that the current wave of privatization is being pushed forward by politicians and state officials rather than being driven by the demands of social groups. The motivations of government could be a deliberate attempt to relax its control over the economy and reorder its political goals, or it could involve state maintaining a controlling interest in the economic and political outcomes whilst the mechanisms for implementing these goals are being reformed.[2] In the latter case, the private sector would then find itself operating within the nexus of economic and institutional control, where prices for key factors of production are administratively set; access to key resources, particularly capital, dependent on political decisions; and state patronage a vital element for success. In such a setting, competition would be stifled and rent-seeking behavior would be the order of the day.

[2] *see* lkenbury (1993).

Shifting responsibilities from the state to NGOs or the private sector alters the institutional framework through which stakeholders articulate, arbitrate and advance their individual and collective interests. In a general sense, it entails the transformation of the prevailing modes of production. Where public agencies have been in charge of irrigation schemes for significant time, a stable system of relationships develops between the agency and farming community, often based on welfarism.[3] Divesting of state management puts in place an alternative sets of equivalents. Private Sector management sees ends and means differently. Their principal aim is maximization of returns to investments. The pursuit of this aim could result in management taking actions that could be to the disadvantage to the farming community and in extreme cases exploitative. Similarly, where user groups take over the management, the interests of the more powerful groups on the basis of class, caste and even political affiliations could dominate production relations to the detriment of the less powerful members of the community. These provide fertile conditions for major conflicts which could stifle P&T programs.

Consequences of P&T programs as outlined above are indicative of the political character of P&T. Ignoring the political perspective misses a larger set of dynamics which could undermine the sustainability of the effort.[4] Yet, in almost all studies the political dimensions that shape the governance of irrigation systems are pushed to the background and assigned a false sense of neutrality. A systematic evaluation of management turnover would require internalizing political economy variables in the analytical framework.

The State and the Irrigated Sector in Sudan

To place the current efforts at P&T in Sudan in perspective, it is necessary to have a broad understanding of government's role in the irrigated sector and the country's institutional legacy.

State intervention in irrigated agriculture started in the first quarter of the century when the colonial government initiated a program to deveiop "livelihood pump schemes" in the Northern Province along the Main Nile. Similar schemes were developed along the White Nile after the construction of Jebel Aulia Dam in the late 1930s. In 1950 the Government inherited the Gezira Scheme following the expiry of the 25 years lease to the Sudan Plantation Syndicate, a group of foreign private entrepreneurs.

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[3] The role of public management agencies is not entirely economic. Usually, social and welfare objectives are given a prominent place.

[4] An elegant account of the political underpinnings of privatization is given in Feigenbaum and Henig (1994).

The 1960s and early 1970s marked the beginning of a new economic era in Sudan when state interventions became highly visible. The government nationalized a number of private sector enterprises and stepped up its intervention in productive activities especially in agriculture (World Bank, 1986).[5]

State involvement irrigated agriculture centered on five key areas: i) the creation of new facilities, ii) formation of parastatal agencies to manage the irrigation facilities and control the means of production, iii) regulating the relationships between the farmers and the management agency through the tenancy contract and periodically transforming it, iv) intervening in the crop production by specifying cropping patterns, planting dates and crop rotations, v) regulating product marketing, especially through the compulsory procurement of cotton at administratively set prices.

Steps have now been taken *to* reduce the. role of the state in the economic affairs of the country and encourage the private sector. Attempts have been made to restore markets, price controls have been removed, imports of production inputs have been liberalized[6]. There has been some expansion in commodity circulation. However, it is not clear just how much autonomy the private sector has gained through these measures. The economy is still characterized by chronic shortages, hyper-inflation and prices bear little relationship to real costs. Taxation is very high.[7] The exchange rate policy which had been the bane of the country's irrigated sector and the economy at large, continues to remain in a state of flux causing added confusion and uncertainty in national markets. Furthermore, the tradition of state dominance continues to be reflected in the institutional framework which remains largely unchanged. Political patronage is still a major factor for private sector participation in economic affairs and rent-seeking behavior is very evident, particularly in the context of the privatization of the White Nile pump schemes. These are indeed difficult circumstances for the smooth implementation of a privatization program, but the process initiated seems to hold out some hope for the future.

Some Characteristics of the Irrigated Sector

[5] Prior to this there were only nine public enterprises outside the financial institutions. By 1984 this number had grown to 136 establishments with government equity amounting to about Sudanese Pounds (Ls) 940 million. Sixteen of these were parastatal bodies concerned with the country's agricultural sector. This includes state bodies which managed the irrigation schemes and the Sudan Cotton Corporation which regulated the market for cotton the principal crop grown in the irrigated sector.

[6] The price of cotton however remains regulated by the Sudan Cotton Company which was "privatized" recently.

[7] At present direct taxes and levies alone account for some 20 percent of the gross proceeds from agricultural products.

The Gezira is undoubtedly the "jewel in the crown" of Sudanese irrigation. With a command area of some 900,000 hectares (2.1 million fedans), it accounts for about half the total irrigated area of 1.8 million hectares developed by government over the last five decades or so. The remaining half come under two major gravity schemes (Rahad and New Halfa), two systems with flood control devices (Al-Gash and Tokar) and several river lift pump schemes located along the banks of the Blue Nile (60 schemes) and White Nile (174 schemes) and in the north on the main Nile (15 schemes).[8]

The families of some 200,000 tenant fanners are dependent on these schemes for their livelihoods. Cotton and wheat are the principal crops cultivated. Other crops which occupy a substantial acreage are sorghum and groundnut. Fodder and a variety of horticultural crops are also cultivated on a smaller scale.

The organizational form and the production relations established in the Gezira Scheme served as the model for the other schemes developed by government. Each scheme is administered by a public corporation functioning under the Ministry of Agriculture. The irrigation facilities in the respective schemes came within the purview of the Ministry of Irrigation.

The overall administration and the organization of production is based on the so-called "triple partnership" between the government, the corporation and the tenants. The government provides the land and water, the corporation the means of production (i.e; seeds, fertilizer, machinery and equipment) and the management (specifying the cropping pattern, cultivation schedule, specifying the irrigation dates and marketing of cotton and wheat).[9] The tenants on their part are responsible for organizing labor for cultivation and harvest (Abdalla, 1989). In return for their efforts the tenants are paid a "profit" through an "individual accounts" system which is applied to cotton and wheat crops which are financed by government.

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[8] In addition there are some privately developed irrigated areas. The exact number is not known.

[9] The uniformity of measures and their execution was controlled by Block Inspectors who have the authority to sanction deviations.

The tripartite arrangement has for long been a rather contentious issue. Until 1982, the tenancy contract was based on share cropping (or joint account) system between the tenants and the government where costs and proceeds were shared on a 50-50 basis.[10] There was no levy on land and water. With the change to the individual account system in 1982, the tenants had to incur the total cost of production inputs for the quantity determined and supplied by the Corporation at administratively set prices. In addition, land and water charges were introduced.[11]

The White Nile Pump Schemes

As the focus of this study is on the White Nile pump schemes a brief account of their salient features is warranted.

The White Nile pump schemes include all the pump schemes on the eastern and western banks of the White Nile. The first pumps were installed in 1929 by private entrepreneurs. There was a substantial increase in private investments in pump schemes for cotton production along the Blue Nile and the White Nile following the 1950 Korean war boom. A decade later, the depression in cotton prices led to reduced profits and a decline in tenants incomes and resulted in major conflicts between scheme owners and tenants' unions. In view of the rapid deterioration of the schemes situation and also as the government policy at the time was oriented towards socialism, most of the private sector pump schemes along the White and Blue Nile were nationalized in 1968.

At present there are some 174 pump schemes located on the banks of the White Nile. The net commandable area in these schemes is around 151,000 hectares (360,000 fedans).

About 31 thousand tenants live in these schemes growing food crops and cotton. The rotation designed for these schemes was originally cotton - sorghum - fallow with a cropping intensity of 50 percent The pattern has not been followed systematically and several combinations with varying cropping intensities are found. The rotation common practiced at present includes wheat - sorghum - fallow with 67 percent cropping intensity.

Some of the White Nile pump schemes have suffered from design faults. In some cases the

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[10] The system was found deficient as it pernutted inefficient producers to benefit at the expense of the efficient tenants.

Much of the decline in cotton output in the 1970s was attributed to the inappropriate allocation of costs and revenue between tenants under the joint accounting which prevailed at that time. Furthermore with the greater emphasis on diversified cropping and demand for effective coordination has brought into question the centralized provision of services and the traditional systems of planning, management and control (Deloitte, Haskins and Sells; 1990).

[11] Initially the tenants union had strongly resisted the change which culminated the 1982 strike organized by the Gezira tenants' union. The tenants subsequently accepted the new system which is continues to date.

location of the pump stations had been inappropriate. There some 50 different makes of pumps installed, many of which are obsolete and break down frequently.

The Performance of the Irrigated Sector

Sudan's economic fortunes depend substantially on the performance of its irrigated sector. Cotton which is the principal crop grown in the irrigated areas accounts for some 43 percent of the export earnings. Irrigated wheat is important in terms of national food security.

Over the last decade or so. the performance of the country's irrigated sector had been well below its potential. Cotton output had recorded a significant drop from 5.8 million metric tons in 1983 to 2.3 million metric tons in 1990. Yields have stagnated or even declined and area under irrigated cotton has come down from 331,795 hectares in 1981/82 to 281,526 hectares in 1989/90 (Table 1). Productivity levels are particularly low in the White Nile pump schemes where the yield levels are about half the national average.

Table 1. Irrigated cotton area arid productivity levels. 1981-90.

SEASON	TOTAL IRRIGATED			
	AREA (hectare)	YIELD (kantars/ha)*		
81/82	331,795	9.28	26,517	5.95
82/83	359,492	11.19	33,523	7.38
83/84	368,932	11.42	25,907	8.33
84/85	346,158	11.42	27,320	6.90
85/86	314,151	8.81	21,914	5.95
86/87	334,377	11.42	23,017	6.66
87/88	306,358	10.21	24,984	5.24
88/89	303,237	11.02	16,533	5.71
89/90	281,526	9.75	13,416	5.00

* 1 Kantar=141.56 kgs

Source: Advisory Unit for Agricultural Corporations. Ministry of Agriculture. Khartoum.

Against this background the public agencies managing the country's irrigation schemes are in serious financial difficulties and there is a high level of indebtedness amongst tenants.[12]

[12] According to a study carried out by Deloitte, Haskin and Sells (1990), in the Gezira Scheme where the tenants on average are relatively more prosperous, the accumulated tenant debts to the Gezira Board as June 1989, amounted to Ls 476.5 million.

The cumulative effect of a number of factors acting over a period of time, account for the poor performance of the irrigated sector. These include a drop in the international market price of cotton; mounting cost of production in the face of high inflation; inappropriate exchange rate policies; inadequate capital especially foreign exchange for investments in the rehabilitation of irrigation facilities, including replacing the antiquated pumps or those which had fallen into a state of disrepair.

Evolution of Privatization and Turnover Policy

Discussion of privatizing Sudanese irrigation dates back to the mid-1960s following a recommendation made by a visiting World Bank mission (World Bank, 1966). Nonetheless, recognition of the complexities of such an exercise given the enormity of the irrigation schemes, their importance to the Sudanese economy, the need to maintain economies of scale, the presence of strong tenants union and government policy biased towards socialist values did not favor the active pursuance towards privatization. The only step towards transforming the highly state regulated management and production system is the introduction of the individual accounts system in the early 1980s.

The idea was rekindled around the mid-1980s, this time on the initiative of the GOS, which was deeply concerned at the rapid deterioration of cotton production in the pump schemes along the Blue and White Nile and the enormous debts accumulated by the two public corporations responsible for their management.[13] The two corporations were dissolved and management of the schemes was vested with two newly created bodies, the White Nile Agricultural Schemes Administration (WNASA) and the Blue Nile Agricultural Schemes Administration (BNASA), until their future was decided.

A noteworthy development at the time was that the decree of the Minister of Agriculture allowed schemes in the Blue Nile and White Nile with pump sizes of 12" diameter to be converted to tenants' agricultural cooperatives and pumps of less than 12" diameter to be turned over to the private sector. Another prominent feature was that tenants were given freedom in the choice of crops as far as it is practically feasible according to the rotation system and the availability of water.[14]

Recent Policy Measures

The Economic Salvation Program 1990-93 reaffirmed GOS's commitment to macro-economic reforms, including the privatization of several public sector entities and liberalizing the economy. An innovation under the program was the creation of the High Level Technical Committee for the Disposition of Public Enterprises under the auspices of the Ministry of Finance.

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[13] GOS (undated), The Future of the White and Blue Nile Pump Schemes.

[14] Mobilizing resources to follow alternative cropping patterns and the difficulty in organizing input supplies and irrigation did not facilitate the freedom of crop choice.

This committee was vested with the responsibility of coordinating and supervising the divestiture of state-owned enterprises and service organizations including those managing the country's irrigation schemes.

As far as the irrigated sector is concerned, the key provisions of the privatization policy are as follows:

i. In the major gravity irrigation schemes (Gezira, Rahad and New Halfa) facilitate greater participation of the tenants in the scheme management. Towards this end, half the membership of the Board of Directors of the respective Corporations were allocated to tenants. Ancillary service units of each corporation (i.e.; machinery unit, Gezira light railways, ginnery) were to be privatized.

ii. In the pump schemes, divesting of the parastatal agencies providing support services to the schemes and transfer of their functions to the private sector and farmer organizations.

iii. The irrigation facilities are not the object of privatization. They will remain under the jurisdiction of the Ministry of Irrigation which would also set out the basic operating rules.[15]

In essence, P&T of irrigation institutions in Sudan as presently conceived entails the transferring of responsibilities for providing support services for irrigated agriculture and not irrigation management functions. This is in marked contrast with most other country situations where irrigation management functions are being devolved.

The program got underway in the wheat season of 1991-92 with the partial divestiture of the White Nile Agricultural Schemes Administration (WNASA).

Implications of Policy and Some Outcomes in the White Nile Area

Divestiture of WNASA

Some authorities on privatization argue that speed in implementation is a vital factor for privatization to succeed. This notion has some relevance in the case of White Nile schemes. Divesting of WNASA had been contemplated since 1986. However, action was not taken until 1991 when WNASA withdrew its administration from all but 38 schemes and retrenched some 70 percent of its staff.

The retention of **38** schemes was considered an interim measure pending the ultimate disbanding of the organization. However, the selection criteria were such that WNASA retained its control over the most productive schemes. In the other schemes (estimated to be some 136) the

[15] There is now a growing recognition of the need to privatize irrigation facilities especially the pumps as well. It is envisaged that under the proposed White Nile Irrigation Rehabilitation project the ownership and management of the pumps would be transferred to water users associations.

tenants were expected to make their own management arrangements.

The sudden withdrawal of WNASA administration surprised the tenants. In some schemes they could not make alternative arrangements on time and were compelled to leave their lands fallow.

At present, sixteen schemes have been taken-over by a private sector company - the White Nile Holding Company (WNHC). Thirty three schemes in the Dueim province have been provisionally brought under a management organization set up on the initiative of the provincial political leadership. The fate of the remaining schemes is unclear. Field inquiries revealed that a large number of the such schemes in Kosti and **Renk** provinces did not have any form of management and lay abandoned. Some of the tenants interviewed indicated that they intend forming a company or such organization to manage the schemes, but they were unsure as to whether they could mobilize the necessary financial resources to do so.

The New Management Systems

Private Sector Management

WNHC commenced operations in the White Nile area in 1991 with the takeover of 6 schemes for wheat cultivation and expanded its operations to cover 16 schemes as to referred to earlier. The total area under these schemes is 16,300 fedans (6933 Ha) of which 13,632 fedans (5725) are devoted to cotton and the rest to wheat. WNHC concentrates its efforts on the cotton cultivation program.

Private sector companies must obtain the approval of the Committee for the Disposition of Public Enterprises. Besides the payment of a nominal fee of Ls. 25 per fedan annually and obtaining the consent of tenants in the respective schemes to enter into a "partnership" with the company, there are no set terms and conditions layed down by the state for the private sector operations. The management contract awarded to the company is for a period of one year. There is no formal contract with the tenants other than the company informing the tenants' representatives of its investment plans.[16]

The reasoning behind the annual contract is that it would give an opportunity for the private Sector and the **tenants** to **try** their arrangements and if it is to their satisfaction, continue the contract for another year. Tough **there** is some logic to this, it has resulted in uncertainty in the minds of the management and the tenants, consequently the management in particular, is reluctant to carry out major or long-term development activities. In addition, it enables the company to withdraw its activities once it finds that major investments are required to sustain the current levels of production.

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[16] Field interviews carried out by the authors revealed that the majority of the tenants were not aware of the conditions under which their representatives had agreed to the company taking over the management of the schemes.

The management system is similar to that previously adopted by WNASA. In fact, most of the company's staff of about 70 personnel are employees of WNASA who had been seconded to WNHC. The staff includes **14** agriculturists who supervise cropping activities and also liaise with the tenants.

Provisions have been made for tenants participation in management. Representatives of the tenants are members of the Production Committee and the Advisory Committee. The function of the Production Committee is to formulate and implement the agricultural plan for the season including the distribution of production inputs among tenants and also supervise cultivation practices and irrigation. The Advisory Committee concerns itself with marketing, financial matters including the scrutiny of tenants' accounts maintained by the company. These committees also serve as channels for resolving conflicts between tenants and WNHC.

A distinctive feature of company management is the reintroduction of the musharaka or the share-cropping arrangements. However, unlike previously where share-cropping was based on joint accounts, the present arrangement is based on individual accounts. Under this system, the company provides all inputs in kind, arranges for land preparation and harvesting, and advances a small amount of cash. Once the crop is harvested, the company procures a part of the produce equivalent to the value of the inputs supplied, administration costs, water charges, and other taxes and levies. The remainder of the harvest is shared on the basis of 60 percent to the tenants and 40 percent to the company.

There is a fundamental contradiction in the prevailing musharaka system. Whilst the company operates on commercial principles with the principal objective of profit maximization, tenants' production activities remains regulated. Decisions about cropping patterns, cultivation methods, the quantity and timing of input use are controlled by the management. The difference is that tenants' activities are now controlled by a private sector company whereas previously they were regulated by a parastatal agency. This in effect amounts to the privatization of scheme management and not privatized imgated agricultural production.

Tenants' opinion about the present arrangements with WNHC was mixed. Some 52 percent of the tenants interviewed stated that this system was better than having no management for at least, it ensured the availability of funds for their cultivation. The rest were apprehensive about it especially because they had no idea about the basis of costing. Moreover, the accounts are maintained by the company and had not been shared with the tenants or their representatives in the Advisory Committee. At present, there are no legal provisions which obligates the company to reveal its accounts as the there is no formal contract with the tenants.[17] **A** majority **(54%)** of the tenants who were skeptical about private sector management indicated that they preferred state management and only **14** percent favored management by tenants' organizations.

[17] **A** sample survey carried out by the authors revealed that most of the tenants did not know the conditions under which the company had taken over the management of the scheme.

Notwithstanding the misgivings, the tenants expressed satisfaction in the provision of services under private sector management especially irrigation. The latter was accomplished by the company taking the initiative to carry out minor repairs to the irrigation pumps and conveyance structure and deducting the costs involved from the water charges payable to MOI. In addition, the company made an "incentive payment" to MOI officials to ensure an adequate and timely supply of water for its schemes.

Dueim Tenants' Management Organization

The initiatives taken by the tenants of Dueim Province to set up their own management organization is unique. It is the first time in the history of irrigated agriculture that the cultivators had taken full charge of the management of the schemes.[18] This was Facilitated by the presence of a strong tenants union and political leadership which fully supported the tenants efforts.

The organization structure consists of *33* schemes grouped into 10 units. Each unit has its Board of Directors comprising of **5** elected tenant representatives and a nominee of the Tenants Union. The unit organizations are federated at the provincial level to form an organization which overlooks all **33** schemes. The provincial level organizations consists of a Board of Directors with 10 unit representatives, three from the Tenants Union and 10 officials attached to local-level public agencies.

Production relations are relatively more liberal than under the other systems of management. Although freedom in the choice of crops is limited, the tenants have the freedom to make their own financing arrangements, purchase of inputs from the open market and sell their produce commercially. Several tenants had self-financed their operations either from their own resources or from informal credit. For those who are unable to self-finance their operations the management arranges for loans through the banks on an individual basis.

The Dueim system represents the first step towards a privatized farmer-managed irrigated agriculture. **A** key factor at the farm level facilitating this trend is that tenants in this area were once freeholders of land who had become tenants on their own holdings when their land was absorbed by the creation of the irrigation scheme. The tenants maintain the identity of their holdings and are currently clamoring for the return of their lands. This signifies the importance of property rights in P&T.

Management **by WNASA**

Although **WNASA** currently functions with a substantially reduced staff its organizational structure has not changed. Production relations based on the "individual accounts system" which is the practice in all agency managed schemes is still in force. Yet, the lack of financial support from the central government and the threat of closure seems to have energized the staff of **WNASA.**

[18] There are several private small pump irrigated holdings which are farmed individually. But the Dueim case represents a collective management effort.

According to the cross-section of the tenants in the 38 schemes managed by WNASA, the provision **of** services had improved substantially. And, in the last wheat season, the highest yields were recorded in a WNASA-managed scheme (see Table *3)*.

Whilst the post-restructuring phase of WNASA has so far been encouraging, the pressure to become a self-financed organization had resulted in the management adopting "cost-recovery" practices which places the tenants at a disadvantage. As was done previously, WNASA supplied all production inputs to the tenants on credit. The cost of inputs are predetermined at the start of the season and recovered in kind from the tenants after harvest. Under this arrangement WNASA makes a substantial profit on inputs as product prices increase within very short periods because of the high inflationary trends in Sudan.[19]

Perceptions *of* Stakeholders

The constituency for P&T in Sudan remains small. The program is being pushed through on the initiative of the Ministry of Finance with the aim of "load shedding" and removing future liabilities to the state by way **of** financing agricultural activities in the schemes. The program is endorsed by senior technocrats in government and some professionals who are now outside the mainstream of public service but function in various advisory capacities. The private sector has so far been unenthusiastic.[20]

A noteworthy feature is that the tenants union - a well organized and politically powerful body - has so far remained passive. A plausible explanation for this is that, although the national leadership exercises its power in negotiating better prices and services, it seem to be less inclined to **take** on regional issues. These are left to the unions of each scheme.[21]

The **key** actors in the privatization of the White Nile pump schemes are: i) private sector companies, ii) tenants represented by the Tenants Union, and iii) WNASA.

The **Private** Sector

Private sector involvement in the management of the White Nile pump schemes has so far been negligible. So far only one company, the White Nile Holdings Company (WNHC) has come forward. WNHC concentrates its activities in the Kosti region. This is partly for logistical reasons

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[19] In the last wheat season (1993/94) **WNASA** recovered the cost of inputs supplied to tenants in kind at the rate **of** S.L 3,500 per sack (100 kg). The open market price of wheat at the time was S.L 7,000 per sack.

[20] Discussion with the authorities revealed that the private sector has a greater interest in the services and industrial sector where there has been considerable progress. The reasons for the poor response towards irrigated agriculture is analyzed in a subsequent section.

[21] The role of the tenants union in the While Nile xhemes is discussed in a subsequent section.

which facilitate management, and partly for other considerations of a strategic nature.[22] The company was not interested in schemes in the other areas especially in the Dueim region, where the tenant union is strong. WNHC prefers to negotiate with tenants directly without the intervention of the union. The company also has very stringent selection criteria which ensures that the schemes selected are those in which the irrigation facilities are in **proper** order and the soil fertile Besides these, the company will only intervene if its *terms* are satisfied, which includes the tenants consenting to a share cropping arrangement.

A key question is why other private sector institutions have shown little interest in managing the schemes. Officially, there are no restrictions for any private company to take over the management of the schemes as long as they have agreed on the terms and conditions with the tenants. Moreover, the private sector has invested substantially in rainfed agriculture since the 1950s.[23]

Inquiries revealed several reasons for the disinterest amongst the private sector for irrigated agriculture in general and the White Nile schemes in particular. Foremost among these is the continued government control over irrigated agriculture. Government intervention in irrigated agriculture remains pervasive at all operational levels ranging from decisions regarding the production of irrigated cotton and wheat to intervening in the pricing and marketing of cotton.

Another major constraint is the difficulty of mobilizing financial resources. At present financing of agriculture is done through state banks and some private Islamic banks. Besides a government's credit ceiling for agriculture, rigid lending conditions prevents easy access to financing. WNHC had been very efficient in this respect. It had been able to mobilize resources from a consortium of eight financial institutions, which includes some state banks and private banks. As to whether other companies could benefit from similar facilities from the existing financial institutions remains unclear.

In addition, the poor physical infrastructure in the White Nile area, uncertainty about government policy, heavy taxation, and coordinating input supplies and services were some of the other reasons advanced by the private sector.

The foregoing circumstances are not conducive for wider involvement of the private sector. In the absence of competition, this represents a shift from state monopoly in the provision of services for irrigated agriculture to private monopoly.

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[22] WNHC avoided taking over schemes in which political climate was not very conducive for its involvement.

[23] **At** present 18 private sector companies have invested in rainfed agriculture covering an area about 158,000 hectares. The area developed by each company varies from 850 hectares to *34,000* hectares.

The Tenants Union

The group of people who are significantly affected by the privatization program are the tenants. As in other irrigated schemes, all tenants are members of the tenants union. The responses of the union of the respective schemes were mixed. In Kosti region where the union is relatively weak, the tenants were willing to enter into a partnership with the private sector. Tenants from Dueim province where the union is strong, and those in schemes managed by WNASA, firmly rejected any involvement of the private sector or at least with those currently operating in the White Nile area. The reasons for this go beyond the fact of private sector intervention to issues which are more political in nature.

Field inquiries revealed that most of the tenants had no idea about the P&T program except for the fact that WNASA had ceased to manage their schemes and they had *to* make their own arrangements to cultivate their holdings. Dueim tenants had succeeded in setting up a management organization with the backing of the provincial political leadership. But those in other areas, except for the **16** under the management of WNHC, are in a desperate situation without any form of management structure. In some of theses schemes informal land transactions such as leasing is reportedly gaining ground.

The WNASA

Following the restructuring WNASA had pruned its staff from about 2000 to the present level of 500 employees. Some of its present staff are on secondment to the private sector or to the newly set up farmer managed schemes. The fate of the remaining staff is unclear.

WNASA is now expected to self-finance its activities. This accomplished through the collection of land charges from the tenants for the services it renders. In addition to this there is revenue generated through the supply of inputs and from the purchase of wheat from tenants at prices well below *those* prevailing in the open market. The financial viability of WNASA under its present organizational set-up is unclear. Besides, the reduction in staff numbers there has not been a major change in its operational mode.

Some Performance **Results** of Schemes Under the **New** Management

It is *too* early *to* provide a detailed analysis of the performance of the schemes under the three management modes discussed earlier. This section provides a preliminary assessment of certain performance parameters. These include: **i)** efficacy in the provision of support services ii) cost effectiveness of service provision, and iii) impact on production.

Efficacy in the Provision of Production Inputs and Services

As noted earlier, the essence of P&T in the Sudanese context entails the transfer of responsibilities of providing support services for irrigated agriculture from state institutions to the private sector and tenant organizations. A sample survey was carried out in selected schemes *to*

ascertain the effectiveness in the provision of support services under the three management modes. The results are summarized in Table **2.**

The responses of tenants given in Table 2 clearly indicates that the provision of support services has substantially improved under **WNASA** management. The major reason for this is that the Corporation currently concentrates its efforts only on a limited number **(38)** schemes whereas previously it had to service some 174 schemes. Besides this, government regulations at present permit only wheat cultivation in the **WNASA** managed schemes, unlike earlier where cotton was grown in addition to wheat. The focus on a single crop enabled the Corporation to coordinate its services more effectively.

Tenants in the Dueim tenant managed scheme reported the worsening in the provision of support services under the present management. The tenant organization is still its formative stages and a suitable organizational arrangements have still not been created. The organization functions with a skeleton staff most of whom **are** employees of **WNASA** who have been seconded to the tenant organization. Another important reason for the deterioration in support services in the tenant managed schemes is that with the withdrawal of state support, tenants have to rely on the open market for their production inputs and services. The private sector is not adequately developed and shortages in input?,,fuel is rampant. Such conditions pose considerable difficulties for the tenants to obtain their inputs and services on time.

Comparison of Cost Structures

Table **3** shows the cost structures of the three management modes. The overall costs of service provision is the least under **WNASA** management. This primarily because tenants opted for manual spraying of insecticides **as** against the aerial spraying adopted by the other two management systems. **This** was in response to the tenants' demands to utilize the existing stock **of** chemicals and manual sprayers available with the corporation. In respect of most other inputs and services the costs **are** less in the farmer-managed systems.

Table 2. Efficiency in service provision under three management modes

	Percentage of Farmers Reporting								
Nature of Service	WNHC (n = 51)			WNASA (n = 52)			DUEIM FMS (n = 57)		
	Better	Worse	No Change	Better	Worse	No Change	Better	Worse	No Change
Seed Supply	70	20	10	47	19	34	19	55	26
Timeliness of Land Prep.	40	60		88	12		30	70	
Provision of Machinery	60	27	13	92	2	6	17	72	11
Fertilizer Supply	45	31	24	79	6	15	38	53	9
Irrigation	95		05	30	10	60	35	40	30

Source: **Authors' Survey** Data

Except for sacks the rates for inputs and services charged by the White Nile Company is higher than the other management modes. The fertilizer costs levied by the company, suggests that the company had applied almost double the quantity applied in the schemes managed by WNASA and tenants.[24]

Table** 3. Cost **of inputs and** services(ls/fedan) **1993194 wheat crop

COST ITEM	WNHC	WNASA	DUEIM FMS
INPUTS			
SEEDS	3,358	3,125	3,217
FERTILIZER	8,223	4,860	4,842
INSECTICIDES	2,160		3,348
SACKS	180	327	317
SERVICES			
LAND PREPARATION	2,000	1,850	1,040
HARVESTING	2,900	2,050	1,640
WATER CHARGE	1,500	1,500	1,500
ADMINISTRATION	500	330	200
OTHER COSTS	1,300	---	64
Average Costs/Fedan	22,574	16,450	17,339

urce: Collected from **the** administrat accounts

Some of the high costs as shown in the accounts maintained by WNHC and WNASA cannot be justified. For instance, machinery costs for land preparation and harvesting charged by WNHC and WNASA **are** above the charges levied by the private sector for tractors and combine harvesters.

Although all three management types collect a nominal administration charge. WNASA and WNHC levy other charges which are not reflected in Table 3 particularly relating to the use of machinery owned by them.

Comparison *of* Farm Business Returns

The fann business returns **are** based on survey data of six selected schemes; two under each management mode. The schemes as well as the tenant sample were *selected* at random. Yield estimates as shown in Table 4 indicate better performance by the Corporation schemes, followed by the Tenant-managed schemes. The variation of yields within these schemes are the least among tenants in the WNASA schemes and was the highest among the company managed schemes.

[24] **As** the company had not divulged its accounts yet **it** is not clear whether a larger amount of fertilizerhad been actually applied or whether it has charged an enhanced amount from its tenants.

The gross return was calculated using a fixed market price of Ls. 6000 per sack. This might overestimate the returns for some of the tenants of **WNASA** and tenant-managed schemes who were compelled by the management to deliver part or all of their produce at a lower price recover the loan taken.

Overall the net returns per fedan were highest in the **WNASA** managed schemes. In one of the company managed schemes the net returns were marginal (Ls. 1,455per fedan) whereas in the second scheme the returns from wheat were negative. The reasons for the lower returns in the company managed schemes is that they are located in the marginal wheat growing areas and hence, productivity levels are lower. In addition, the company concentrated its efforts in the cotton growing schemes and failed to organize its cultivation schedule in the wheat growing systems on time.

Conclusions

Sudan is one of the many countries in transition from a planned to a more market oriented economy. It is one of the few countries attempting to go through the process without pressure from external sources. Mounting economic difficulties in the country had forced the government to engage in a "load shedding" exercise. The "privatization" of the agencies managing the country's irrigation schemes was part of that endeavor.

Privatization is a complex and costly exercise. This is particularly the case with the irrigated sector of Sudan, given the capital intensity of irrigated agriculture, and the intricate socio-economic and political environment in the irrigation schemes. Moreover, decades of rigid government control of the economy has stifled the private sector both in the agricultural and industrial sector. The institutional framework had been structured to cater

ible 4. 1993/94 wheat op - Thefarm bu iess retu s (ls/fedan)

SCHEME MANAGEMENT	Yield/Fedan (sacks)'	C.V.	GROSS RETURN	COST OF PRODUCTION	NET RETURN
CORPORATION					
SCHEME 1	7.91	.30	47,640	16,647	30,813
SCHEME 2	6.7 1	.30	40,260	16,254	24,006
FARMERS					
SCHEME 1	5.09	0.41	30,540	17,464	13,056
SCHEME 2	**4.30**	0.35	25,800	17,214	8,586
COMPANY					
SCHEME 1	4.02	0.50	24,120	22,665	1,455
SCHEME 2	3.01	0.61	18,060	22,483	($423)

1. sack = 100 kgs

to the needs of a state dominated economy. Although government had embarked on P&T in 1991, it has concentrated its efforts exclusively on divestiture of the parastatal agencies. It had been somewhat lax about delineating the means of implementing and adopting measures which would ensure that the new management systems function effectively. In addition to the highly interventionist policies, the absence of a developed input and product market, high taxation levels and the presence of powerful tenants' union act as disincentives to the private sector participation. As noted earlier only one company had shown interest in taking over the management of the pump schemes. The absence of competition may lead to private sector entities exercising monopolistic powers which could be detrimental to the interest of the tenants and pave the way for exploitative tendencies to emerge. The absence of formal measures for regulatory oversight of private sector activities may aggravate the problem.

In the light of the foregoing shortcomings only one company has taken over the management of selected number of the schemes and there is the danger of the privatization program in Sudan taking the form of a shift from public monopoly to private sector monopoly in servicing irrigated agriculture in the White Nile pump schemes.

Given the capital intensity of imgated agriculture in Sudan, the availability of credit facilities is a major determinant of success in agricultural production. At present credit facilities are channelled through state banks and some private banks. The lending conditions are such that access to credit is difficult for most entities. Lack of credit was a major constraint encountered by the Dueim Tenant Management organization and some private sector companies.

Tenants in the imgation schemes in Sudan had functioned under rigid state control. Under P&T, tenants in some schemes have taken the initiative (as in Duiem) to set up their own management organization. However, these organizations lack managerial expertise. Training in scheme management and development of the entrepreneurial skills of tenants are needed.

Viewing P&T solely as way of transferring management responsibilities from the state to non-governmental entities is simplistic. It is not the end in it self rather than the means to an end. As Vermillion (1993) observes, if P&T is to lead to sustainable and positive results, it would require more than policy enactments. It is a change which would require an evolution towards liberalizing the fundamental institutional environment of irrigated agriculture. Where this has not yet transpired, turnover policies should be more gradual and focussed more on creating viable local institutions.

Key Issues

The scope of the privatization and turnover program in Sudan as presently conceived, and the macro-economic environment in which it is being implemented is not typical of most other country situations where reforms in irrigation management are being implemented. Nonetheless, based on the case study of the P&T of the White Nile schemes the following are some key issues which need to be considered when designing a management turnover program.

i. The Need For A Vision

To start with, governments need to have a clear vision about the future role of irrigated sector in the economy and a strategy to develop irrigated agriculture. It is within the context of the goals of the irrigated sector that governance structures need to be designed and implemented.

In Sudan and it seems to be the case in most other countries, the emphasis has been on transferring the management of irrigation schemes to farmer organizations/private sector with the aim of curbing public expenditure. As to how the management shift would contribute to improving the performance of imgation schemes is less clear.

At present there seems to be an exaggerated confidence placed on farmer organizations in their ability to manage imgation systems. The setting up of farmer organizations is a relatively recent innovation in the irrigated sector. **But,** such organizations are not new to the agricultural sector. There are many examples of governments in developing countries setting up farmer organizations/associations/ committee to manage/administer various aspects of agricultural development. These organizations which enjoyed the same degree of enthusiasm currently accorded to farmer organizations in irrigation schemes, have collapsed." The experience of such failed organizations could be useful to farmer organizations in irrigation schemes.

Other management options need to be considered. Management contracts to private sector as in Sudan is another possibility. Although the Sudanese experience is not very convincing due to reasons stated earlier, the management contracts have been very successful in the provision of certain municipal services. Joint enterprises involving farmer organizations and provincial governments is another option. The Dueim Model in Sudan could be instructive in this regard.

ii. Choosing Complementary Macro-Economic and Sectoral Policies

The mere change in ownership or management systems will not guarantee the desired results. In fact, numerous studies relating to privatization in industrial and services sector have clearly shown that it is immaterial whether *the* ownership **of** an enterprise is public or private, but it the economic environment in which they operate. The positive effects of management change are far from automatic. This would **require** appropriate macro-economic and sectoral policies which could involve deregulation and liberalization, providing incentives to foster greater competition and less government interference *to* permit

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[25] For example in Sri Lanka, village level cultivation committees comprising of elected representatives of farmers were set up in 1958under the Agrarian Services Act. The failure of this institution led to the creation Cultivation Committees at the village level and Agricultural Productivity Committees consisting of farmers who were appointed by the political authority. None of these institutions exist now.

greater freedom of entry to private and other non-governmental agencies in the provision of goods and services.

iii. Institution and Capacity Building

Before management turnover can take place in countries that had been highly state regulated, the basic foundations for non-governmental entities to function effectively need to be constructed. This would require not merely the relaxation of state control but, design of institutions that private sector and non-governmental entities could rely upon to protect their rights and interests. It requires the active effort of the state to design the legal framework and institutions in relation to property rights, water rights and the rights of non-governmental organizations such as farmer organizations.

New institutions are needed not only at the macro-level but at the micro or scheme level where the policy is being implemented. These include institutions for the provision of various support services such as extension, credit, marketing and input supply.

Besides the creation of institutions, there is the need for capacity building. In the case of Sudan the Tenants Union had functioned as a strong lobby and devoted its energies to obtain better deals for its membership. They *are* excellent negotiators, but they may need to develop their managerial capacities.

In addition, there must be an appropriate incentive structure for farmers to take management responsibilities of their schemes. At present there *are* no such incentives, the schemes in which farmers have created some form of organizations have done so through sheer compulsion to fill the vacuum created by the sudden withdrawal of WNASA. Fortunately such schemes had strong tenants union and also a committed political leadership to back their efforts. Not all schemes have this advantage. In Asian irrigation, the state provides a number of incentives for farmers organizations. In Sri Lanka, farmer organizations are given small tractors on easy payment terms once they have attained certain performance standards.

iv. Need for Oversight

The transfer of management of irrigation systems from the public sector to non-governmental entities represents a radical organizational change. This would result in the transformation in production relationships between the farmers (here tenants) and the management agency. Under state management, the principal objective is service provision. In addition, social and welfare objectives are given a prominent place. The private sector on the other hand, sees the means and ends differently. They do not focus directly on social welfare or providing a defined level of goods and services. Their principal objectives are financial. The aim is to maximize the returns to their investment. The pursuit of this aim, could result in the management taking measures which would to the disadvantage of the tenants, at times this could even be exploitative. There are well known examples of such occurrence. which became institutionalized. Government should beware of such

developments and formulate and put in place appropriate mechanisms for oversight, to ensure that costs are not high, the quality service maintained and prevent the emergence of undesirable production relationships. Unrestrained privatization could be disastrous.

v. The Role of the State

Privatization entails redefining the responsibilities of the state in irrigation management and also the elucidation of the role of the private sector and non-governmental bodies - both at the national level and at the state/provincial levels. These should be widely communicated as it would instill confidence among the various stakeholders and prevent misunderstandings of the intentions of the government.

Outputs to Date

1. The following papers based on the study were presented at the workshop on "Privatization experiences in Irrigation" jointly sponsored by the Ministry of Irrigation, Arab Organization for Agricultural Development and IIMI held in Khartoum, Sudan, 21-22 June, 1994:

   a. "Review of Policy on Privatization and Turnover in Sudan with Particular Reference to the White Nile Pump Schemes".

   b. "The Management Changes and the Performance of the White Nile Pump Schemes".

   c. "Performance Evaluation of Diesel Pumps in the White Nile Irrigation Schemes under Two Management Modes".

ii. Paper entitled "Political and Economic Dimensions of Privatization of Irrigation Schemes in Sudan" presented at the "International Conference on Irrigation Management Transfer", Wuhan China, 20-24 Sept. 1994.

iii. Paper entitled " Privatization and Turnover of Irrigation Schemes in Sudan: The Case of the White Nile Pump Schemes", presented at the Annual Internal Program Review, 1994.

6. Planned Output

Research Monograph/Country paper on the case-study will be finalized in the first quarter of 1995.

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3.6 Survey of Irrigation Management Turnover in India

This study began in October 1993 and continues through March 1996. Donors are the Ford Foundation-India and BMZ, under the PSM Program. The Ford Foundation funds the costs of the project for local staff and IIMI country program staff. The PSM Program provides for the cost of Local Management Program staff inputs. A country paper on turnover in India will be produced for Phase I of the PSM Program.

Objectives The overall objectives of the survey of irrigation management turnover in India are

(1) to determine the types of turnover activities now occurring in selected states in India,

(2) to develop a detailed understanding of the processes and constraints of the most important types of turnover, and

(3) if feasible, to evaluate the impact of turnover on system performance and outputs, including the differential impacts of turnover on different segments of the farm population.

Brief Description of Activities The study is being implemented in two phases. Phase I of the study involves a joint reconnaissance (along with the Indian Institute of Management, our collaborating partner) in six selected states during which policies and programmes are identified through interviews in the state capitals and actual activities are identified through rapid assessment of selected field sites. Three states - Tamilnadu, Gujarat and Maharashtra - have been covered and the remaining states - Kerala, Haryana, and Bihar - are programmed to be visited in the coming months.

During Phase II, detailed process studies on the most important types of transfer currently occurring are to be undertaken in a limited number of states. This work has recently begun at 17 sites in three states - seven sites in Tamilnadu, five sites in Gujarat, and five sites in Maharashtra. These studies will end by May 1995.

Results to Date The following is a brief preliminary summary of the status of the turnover activities in the three states visited:

1) Tamilnadu

Tamilnadu's organization for management of irrigation systems is somewhat different from that of most states.

- The responsible agency is the Public Works Department (PWD) which has two wings - irrigation and buildings. Irrigation is the larger of the two wings but engineers are often transferred between the wings.

- Tamilnadu has no Command Area Development (CAD) organization. Centrally funded CAD projects are handled by the Agricultural Engineering Department (AED) which comes under the Ministry of Agriculture.

- There are no direct water rates charged to farmers. Water rates are collected in the form of increased land taxes for irrigated land.

  Groundwater use is subsidized by giving free electricity to pumps up to 5 horsepower in size.

A key element, however, is that Tamilnadu has a long history of farmer responsibility for managing irrigation systems. First, irrigation from tanks is very common; there are some 39,000 functioning tanks in Tamilnadu. The great majority of these *are* very small and *are* managed exclusively by farmers although by law they are the responsibility of local panchayat organizations. However, water distribution in many larger tanks is also handled by farmers through customary arrangements, many of which antedate the PWD. Second, all large canal systems in *the* state have been designed to incorporate most of the pre-existing small tanks; distribution of water and maintenance of the tanks and below is left solely to the farmers and panchayats. Third, it has been the practice to consult farmers for seasonal planning in most larger systems.

Interviews with policy-makers in Madras in June 1994 revealed that, with certain exceptions, there was little interest in turnover at the policy level. Most importantly, the Secretary of PWD and the officials from Planning showed little knowledge or interest in turnover. The exceptions were:

  Several persons said that, because the state cannot provide enough funds for maintenance, the practice of *kudimaramath*, under which farmers were obligated to maintain the irrigation system at the orders of the zamindar or local political leader, should be revived.

- The Secretary of Agriculture and the personnel of the AED were interested and working on the creation of fanner organizadons in large systems.

- An official from the Treasury indicated that some funds had been set aside to use for promoting the "Salipperi model" under which funds raised by a farmer organization are matched by the state and the whole put in the bank so that the interest can be used for regular maintenance.

  The PWD has been negotiating with the World Bank for the Water Resources Consolidation Project (WRCP). The World Bank is insisting that the WRCP include the creation of farmer organizations and the turnover of management functions at lower levels in the larger systems to organized farmers. Therefore. some work has been done on plans for this work under the WRCP.

Thus, although there are some specific ideas being considered at the policy level, there is no general agreement nor consistency in the various ideas. The state cannot be said to have a consistent

policy. On the other hand, there are several important experiments going on in the field. These include:

- Since **1984,** the Centre for Water Resources at Anna University, with financial support from the Ford Foundation, USAID and the EEC, has been working to organize farmers on minor tanks to help with **tank** rehabilitation and to manage distribution and maintenance after rehabilitation.

  Since 1986, the Irrigation Management Training Institute has been working with farmers at Salipperi in the Cauvery Command to create a local organization to distribute water and maintain canals. This is the origin of the "Salipperi model" mentioned above.

- Since **1988,** the **AED** has been carrying out a large-scale farmer organizing program in five major systems in the state. This program was started by one of AED's engineers who was inspired by a visit to the Philippines. They **are** using a three level model: the lowest level is at outlet level and is called a "sluice association", the second level is a federation of sluice associations on a distributary and is called a "farmer council", the top level is a scheme level committee made **up** of representatives from the farmer councils and is called the "apex organization." This program is discussed further below.

- In **1993-94,** the Centre **for** Water Resources at Anna University, with financial support from USAID, has worked on organizing farmers along one channel in the Tamiravarni System.

Of these programs, by far the most important and most successful has been AED's program. They have managed to create well over 800 sluice associations and more than 100 fanner councils in the five large systems taken up. Since all of the systems are very large - the smallest has a command of over 20,000 hectares - no system is fully organized. The earliest and best documented case is that at Thindal in the Lower Bhavani Project. Only one apex organization has been created so far - at Lower Bhavani Project. Visits to four of the five systems show that these organizations *are,* in general, not tembly strong. Most play only a small role in irrigation system management. For the most part, these organizations are not recognized by the system managers from the PWD; most PWD officers deny any need for such organizations.

In fact, there appears to be strong antagonism between PWD and AED officers over this subject. This antagonism shows up in the refusal of the PWD to consider making use of AED to organize farmers under the proposed WRCP even though **AED** now has the experience and proven ability to do so while the PWD has no experience at all.

Overall, then, in Tamilnadu there is a strong tradition of farmer responsibility, there are important experiments in farmer participation and turnover going on, but there is no clear and consistent policy concerned with turnover.

2) Gujarat

In Gujarat, there is a great deal of interest among senior administrators in the state in turning over some of the management functions to groups of users in the irrigation systems.

Currently, Gujarat's law and policy specify that water is to be distributed to individuals under the *shejpali* system. Under this system, each season each farmer is supposed to apply for irrigation service for a particular crop and a particular area. He is supposed to pay ahead of time. With this information, then the Water Resources Department officers are supposed to be able to plan water deliveries to match crop needs. In larger systems it has proven impossible to get farmers to make the applications. Even if they were to make the applications, the systems lack the management and control capabilities needed to adapt water delivenes to the widely varying crop needs.

To solve this problem, various individuals have adopted ideas from several sources. The current plan is to a) get the farmers to form water user cooperative societies at minor canal level, b) have the water user societies apply for water, c) deliver water to the water user societies and let them distribute water to individual farmers, and d) charge the water user societies for the volume of water delivered rather than on a crop-area basis.

Quite a bit of effort has been expended in putting a policy for this in effect. A draft law was created in 1990 but lapsed in six months due to inaction of the Legislative Assembly. Some experiments in the transfer of management functions have been facilitated by specific government orders. Recently, the government appointed a high-powered Committee to draft a policy on turnover. Moreover, a decision was reached some years ago that Narmada water from the Sardar Sarovar Project would be distributed only to groups of farmers rather than to individuals. Some of the senior administrators have been taken to other countries where turnover has been successful. These individuals have been instrumental in changing the thinking of high-level government bureaucracy.

There have been some experiements carried out in Gujarat, although compared with other states, the progress is disappointing.

- The famous Mohini Society in Ukai-Kakrapar Command led to the creation of about 30 similar societies elsewhere in the Command, mostly created by interested farmers with the help of Water Resources Department personnel. Few of these societies, however, are managing water effectively.

- Since 1985, the Water and Land Management Institute, helped at times by the Institute of Rural Management Anand, have tried to organize farmers on minor canals within the Mahi-Kadana Command. To date, two societies have been organized.

- The Aga Khan Rural Support Program **(AKRSP),** influenced by the successful farmer-managed lift irrigation systems organized by the Sadguru Society, also created such societies. Beginning in 1988, they expanded their lift imgation program to organizing

farmers to take over and improve the main canals on minor surface irrigation schemes. Work is now going on in 4 such schemes. The Water Resources Department retains control over the reservoirs, including water allocation to the main canals.

- More recently, the state has begun turning the management of some state tubewells over to water user societies. It appears, however, that most of these cases are more cases of takeover when the state fails to live up to its management responsibilities.

Although other cases of farmer managed systems have been found, there are no other major cases of turnover. Special legal support has been given by the government to some of these experiments. The Ukai-Kakrapar, Mahi-Kadana, and AKRSP societies are being charged for water on a voumetric basis. The AKRSP has managed to convince the government to let their societies charge the individual members water water rates higher than those charged by the government in order to give the societies a way to raise sufficient funds to undertake maintenance. Also, some of the improvement works have been awarded to farmers in the AKRSP schemes.

Overall, then, although considerable effort to promote turnover has been expended at the policy level in Gujarat, there is still relatively little to be seen in the field. Moreover, the policy does not envisage farmer involvement at system level; the policy change is that water will be delivered to groups of farmers as per demand rather than to individual fanners as per demand. No mechanisms to make the Water Resources Department accountable to farmers are under consideration.

3) Maharashtra

Imgation management in Maharashtra, as in Gujarat, has been based on the shejpali system. However, to serve the interests of the sugar industry, the law was modified over 80 years ago to allow selling of water on a volumemc basis. However, some restrictions have been placed on water use. One has been a limitation on water use for sugar, the most remunerative and popular of irrigated crops. Another was a restriction on the use of groundwater and canal water for the same piece of land in order to clearly know what land can be charged for use of canal water.

As in Tamil Nadu, there appears to be some disagreement over policy concerning farmer responsibilities among top administrators. The Chief Secretary denied that any experiments in turnover were occumng in the state. The Secretaries of Planning and Finance knew things were occurring but had their doubts about the value of the efforts. Support for fanner participation and turnover was strongest in the Irrigation Department. The ID has prepared a manual on why turnover is necessary and how to do it and is encouraging its own officers and NGOs to organize farmers for turnover. The ID's Directorate of Irrigation Research and Development (DIRD) has been given the job of monitoring progress.

The basic model for organization and turnover is based on the well-known experiment at Minor 7 in Mula Command. There, all of the farmers on the minor were organized into a water user association (WUA) and registered as a cooperative, along the way forcing the Cooperatives

Department to create a new category of cooperative and define appropriate procedures for registration. They have also been given concessions, including **repairs** to their canals, an MOU with the ID that guarantees them a certain amount of water annually delivered as requested by the WUA, volumetric pricing of water that is slightly lower than standard shejpali rates with a rebate of 20%, maintenance grants, and freedom from restrictions on crop choice and conjunctive use of surface and groundwater.

The DIRD reports **46** fully functioning WUAs in 18 *major/medium* schemes and another five in five minor schemes. Another **63** WUAs are in the process of formation and an additional 106 have been proposed. The impetus for formation has come partly from NGOs, Mula Minor 7 had the support of CASAD and SOPPECOM, an outgrowth of CASAD, is now working in several places, including on an experiment to create a federation of WUAs in the tail of Mula Command. There are at least **3** other NGOs involved. The other major impetus has been donor funded projects. The USAID funded Maharashtra Minor Irrigation Project has required that minor schemes built by the project be turned over to farmer organizations; also the World **Bank** funded Maharashtra Composite Irrigation Project III requires creation of WUAs in the covered schemes. The Maharashtra WALMI is also involved in an experiment in turnover on a minor scheme.

In addition, there have been programs and there is government support for farmer management of lift irrigation schemes, although this generally does not involve turnover from the government to the farmers.

A quick review of the existing fanner organizations shows that some, such as that on Mula Minor 7, are quite strong and capable. One set of three organizations in the Waghad scheme (based in Ozar village), has even taken to regulating and charging for the use of the increase in groundwater supplies brought about by WUA activities. Other WUAs are not so impressive. The main. motivations for the farmers to get involved appear to vary from place to place. In larger schemes it seems to be the "guarantee" of water delivery - establishment of a kind of water right. In other places, freedom to select crops is equally important.

Overall, then, Maharashtra *appears* to have a good balance between policy development and experiments in the field. That is, policy is being developed to support the experiments. One major difference between Maharashtra and the other two states **is** that the government is willing to invest in this program. The incentives offered to **farmers** will, in the short run, cost the state money. In the long run, relief from the administrative burden of shejpali and the taking over of much of the maintenance by farmers will lower to costs of O&M for the state. The contrasts in the three states are quite striking.

3.7 Short Report Series on Locally-Managed Irrigation

The purpose of the Short Report Series is to disseminate concise information on locally-managed irrigation and irrigation management transfer or turnover experiences world-wide to a broad range of people--policy makers, planners, researchers, donors and officials in both public and non-governmental organizations--who are concerned with the irrigation sectors of primarily

developing countries. IIMI's intention is not to promote irrigation management transfer per se, but to enhance the knowledge base available to decision makers and advisors as they face questions of policy adoption and strategies for implementation. The purpose of the Series is to disseminate widely in a concise format information and ideas about locally-managed irrigation and management turnover around the world. Locally-managed irrigation can be of many types, such as traditional farmer-constructed diversion or tank schemes, indigenous and often new lift irrigation, government-constructed but farmer-managed irrigation systems and systems where management is or has been transferred from an outside agency to a local user organization.

In 1994 IIMI produced and disseminated through its Farmer Managed Irrigation Systems Network mailing list six papers in the Short Report Series, as follows:

Farley, Peter J. 1994.
Privatization of Irrigation Schemes in New Zealand. No. 2.

Gazmuri S., Renato. 1994.
Chilean Water Policy. No. 3.

Wijayaratne, C.M. and Douglas L. Vermillion. 1994.
Imgation Management Turnover in the Philippines: Strategy of the National Irrigation Administration. No. 4.

Vermillion, Douglas L. and Carlos Garces-Restrepo. 1994.
Irrigation Management Transfer in Colombia: A Pilot Experiment and its Consequences. No. 5.

Nagata, Keijuro. 1994.
Land Improvement Districts in Japan. No. 6.

Srivastava, L.P. and Jeffrey D. Brewer. 1994.
Imgation Management Transfer at Paliganj, Bihar, India. No. 7

Through correspondence with authors and technical editing several additional pending Short Reports were under preparation during 1994. These include papers on tubewell management transfer in Bangladesh, privatization of irrigated agriculture in Sudan, participatory management in Sri Lanka, management transfer in the Columbia Basin, USA, irrigation sector privatization in the Senegal River valley, small-scale irrigation turnover in Madagascar and privatization of lift irrigation on the White Nile, Sudan.

3.8 International Conference on Irrigation Management Transfer

IIMI's Local Management Program sponsored the International Conference on Irrigation Management Transfer which was held in Wuhan, P.R. China September 20 though 24, 1994. The Conference was attended by 220 participants from 28 countries. Main donors for this major event were the Ford Foundation, CIDA, FAO, BMZ, IDRC, Oxfam, Australian Catholic Relief Services and the Mekong Secretariat. To sponsore the Conference, IIMI collaborated with Wuhan University of Hydraulic and Electrical Engineering (which made all arrangements for housing, food, use of facilities, field trips, certain sessions and presentations), Wuhan University (which provided the Conference hall and rooms), Hubei Association of Science and Technology (which arranged visas

and domestic transportation), Hubei Association of Hydraulic Engineering (which arranged field trips), Hubei Province Ministry of Water Resources and National Ministry of Water Resources (which gave approval and guidance for the Conference).

Objective The overall objective of the Conference was to enhance policy making, planning and implementation of irrigation management transfer programs world-wide through the exchange of information and experiences about irrigation management transfer between a large number of professionals from many countries.

Brief Description of Activities During 1994 IIMI staff attached to the PSM Program, as well as staff of IIMI's Travel and Information Offices, were very busy in the planning and implementation of the Conference, which included arranging international and domestic travel, visas, organizing sessions, field trips, technical review and selection of papers submitted, preparation of three volumes of Conference papers, preparation and delivery of Conference papers and addresses, selection of participants, editing of papers and preparation of publication of the selected proceedings.

Outputs A set of three volumes of all papers has been produced and distributed to all participants, donors and others. A selected proceedings publication will be produced as an edited book within six months. Two or three papers will be produced under the Short Report Series.

Significant Findings The Conference demonstrated the strong interest many countries world-wide have in irrigation management transfer. Many issues and findings emerged about necessary pre-conditions for enabling management transfer to succeed, the process of implementing management transfer, agency re-orientation, financing and how to make locally-managed irrigation sustainable after transfer. The following is a list of key issues and recommendations raised by participants at the Conference.

1. Lack of clear water rights, weak or non-legal status of farmer organizations and illdefined separation of roles between the irrigation agency and farmer organizations *are* common conditions which seriously weaken the capacity of turnover programs to result in viable locally-managed irrigation.

2. Five vital management elements must be in place for irrigation management transfer to result in sustainable locally-managed irrigation. These elements *are:*

- sustainable and recognized water right,
- functional infrastructure which is compatible with the water right and local management capacity,
- clearly defined management responsibility and authority,
- supportive management accountability and incentives and
- adequate resources.

3. Management transfer which is partial or involves incomplete control by farmers leads to unstable management characterized by limited cost efficiency and staff accountability. Turnover is often partial, with agency staff continuing to exercise partial control over water distribution or budgets after turnover. This leads to a poor response by farmers and unsatisfactory results. This can create a false impression of failure which can reinforce resistance to turnover policies.

4. Turnover should be treated as an evolving program rather than as a short-term project with rigid quotas for turning over set numbers of systems per year.

5. There is a frequent lack of strategic planning to reorient agencies and plan pro-actively for staff disposition prior to the implementation of turnover. This compounds agency resistance to turnover programs.

6. There is a frequent lack of clarity about who is responsible for rehabilitation after turnover. This creates an atmosphere of speculation and a tendency among farmer organizations to defer maintenance.

7. Effective farmer organizing requires genuine negotiation.

8. Establishing motivating conditions for farmer organizations to take over irrigation management is more important than investing in efforts to motivate and train farmers.

9. Farmers do not always prefer to take over ownership of irrigation systems. Often they fear that this would create liabilities, new taxes or require them to fully finance the future costs of rehabilitation.

10. Farmers do not always want complete withdrawal of the agency from dealings with their irrigation system. Farmers often want continuing agency assistance for technical guidance, rehabilitation, dispute resolution, financial audits and subsidies.

11. Abuse of authority by factions after turnover is seen by less powerful fanners as a risk which is associated with management turnover. They may therefore seek continued agency involvement in auditing, regulating and helping to mediate conflicts.

12. Rehabilitation is often done before turnover without meaningful farmer participation and investment. This can discourage farmers from taking over responsibility for the irrigation system after turnover. In contrast, farmer participation and investment in system improvements prior to turnover can be an effective means of preparing farmers to take over long-term responsibility for irrigation systems.

13. The common joint management arrangement of turning over management responsibility to fanners organizations for tertiary and distributory canals and having agencies retain management responsibility for main system canals often appears to result in unstable,

confusing, unaccountable and ineffective management of medium and large scale irrigation systems.

14. Farmer organizations often evolve into multi-functional organizations, going beyond irrigation O&M to sideline enterprises, provision of agricultural credit and inputs and marketing. This has happened spontaneously in China, the Philippines, Sri Lanka, Colombia and the USA after management transfer. This is seen by some as a threat to a needed focus on the irrigation function and by others as necessary to increase farmer incentives to support group action.

15. After turnover, farmer organizations often seek secondary revenue sources to cross subsidize water charges in order to replace earlier government subsidize with private sector ones, to keep the cost of water from rising too high after turnover.

16. Farmers tend to place a strong emphasis on reducing costs after turnover. This can threaten the physical sustainability of irrigation systems, especially where it is not clear who is responsible for rehabilitation after turnover.

17. Farmer organizations seem to rarely raise capital replacement funds after turnover. This can be a cause for concern about the long-term physical sustainability of irrigation systems after management is turned over to farmers, especially if it is questionnable that governments will be able to afford to finance rehabilitation in the future.

18. Irrigation systems which were originally designed to be managed by trained engineers or technicians so as to maximize water user effeciency and flexibility of operation is often incompatible with the management capacities of farmers.

19. Management transfer commonly involves increased cost to farmers for irrigated agriculture, especially where farmers were not paying for the full cost of irrigation before turnover. This can be a disincentive for farmers to take over management of irrigation systems.

20. Strong high-level political support and support among farmers for management turnover is essential if agency resistance to turnover is to be overcome. It may not be adviseable for policy makers to have resistant irrigation agencies implement tumover programs. Consideration should be given to having neutral organizations, such as NGOs or companies, implement turnover programs.

21. In several countries governments are establishing performance assessment units concurrently with the implementation of turnover programs, with an aim of assessing the performance of systems after turnover. Agencies show little interest in assessing the performance of agency-managed systems.

3.9 Global Survey of Irrigation Management Turnover

Out of over 20 survey forms mailed out to irrigation officials or experts only six completed forms were returned. Respondents appeared to have some difficulty in filling in appropriate responses in the survey forms. Therefore the survey was discarded. A simplified version may be prepared under the proposed PSM Phase II study and an effort may be revived in the near future to collect a core set of essential information on imgation management turnover programs in many countries around the world. A key challenge will be to identify the right people to send in the information.

4. WORK PLAN FOR 1995

Phase I of the Privatization and Self Management Program ends in May 1995 so the remaining activities described below pertain to a five-month period of time.

4.1 Five Case Studies on Irrigation Management Turnover

The case study on irrigation management turnover in the Columbia Basin, USA has been completed and the report will be incorporated into the PSM Phase I final report.

The case study on imgation management turnover in Colombia, South America is not yet completed. Some remaining data collection will be done in February on the physical condition of infrastructure, nature and result of rehabilitation and farmer perceptions about the effects of turnover on management performance. This data and data on irrigation distributional efficiency and equity and agricultural performance remains to be analyzed. Chapters on irrigation policy and an overview of recent turnover in the country will be written by 31 March 1995. Other chapters on the turnover arrangements, process and results will be revised and the study completed by the end of April. Drs. Vermillion and Garces-Restrepo are completing this.

The case study on irrigation reform in north China will also be completed by 30 April. The introductory, policy overview and concluding chapters will be written by the end of March. Other chapters on institutional arrangements, management practices and impact assessment have been drafted and will be revised by 31 March. Drs. Vermillion, Johnson and Svendsen are completing this together with Professor Liu Changming of the Shijiazhuang Institute of Agricultural Modernization.

The case study on management turnover in Sri Lanka will be completed by 30 April 1995. Data analysis for the large survey of systems and the case studies in Kaudulla and Mahaweli C will be completed by 31 March. The draft final report will be written by 30 April 1995. Dr. Jeffrey D. Brewer and Wim Kloezen are the primary investigators responsible for this study.

The case study on privatization of pump imgation systems along the White Nile in Sudan is also due for completion by 30 **April** 1995. Data analysis **is** currently underway in Sudan and at IIMI headquarters in Sri Lanka. This will be completed by 31 March 1995. Drs. M. Samad and Dingle are completing this study.

4.2 Survey of Irrigation Management Turnover in India

The Phase I reconnaissance survey of irrigation management turnover was completed in three of the **six** sample states of India during 1994, Tamil Nadu, Gujarat and Maharashtra. The Surveys for Haryana, Bihar, Maharashtra and Kerala will be completed by 30 April 1995 after which a workshop will be held to review the results. Working papers describing the findings in each state are under preparation. During Phase II, more detailed process studies on the most important types of transfer currently occurring is being carried out during 1995 in several sites in Tamil Nadu,

Gujarat and Maharashtra. Field work for Phase II has begun at seven sites in Tamil Nadu, 5 sites in Gujarat, and 5 sites in Maharashtra. This field work will be completed by May 1995. An interim summary paper of available Phase I and Phase II results will be included in the PSM Phase I Final Report.

4.3 Short Report Series on Locally-Managed Irrigation

The following papers are currently under production or technical edit for the Short Report Series and will be published and distributed through IIMI's FMIS Network before 30 April 1995. They are listed in expected order of production.

Betancourt, Gilberto Garcia. 1994.
The Emergence of Federriegos: The National Federation of Irrigation Districts in Colombia. No. 8.

Wester, Philippus; Arjen During and Joost Oorthuizen. Forthcoming.
Locally Managed Irrigation in the Senegal River Valley in the Aftermath of State Disengagement. No. 9.

Kloezen, Wim and M. Samad. Forthcoming.
Synthesis of Issues Discussed at the International Conference on Irrigation Management Transfer held in Wuhan, P.R. China, September 20-24, 1994.

Mandal, Sattar and Donald Parker. Forthcoming.
The Evolution and Implications of Decreased Public Involvement in Minor Irrigation Management in Bangladesh.

Shanan, L. and S. Berkowicz. Forthcoming.
Irrigation in Israel: Policies, Planning and Performance.

Svendsen, Mark and Douglas Vermillion. Forthcoming.
Irrigation Management Transfer in the Colombia Basin, USA.

Droy, Isabelle. Forthcoming.
From State to Farmer Managed Irrigation in Madagascar: The Case of Small Scale Irrigation.

Kloezen, Wim. Forthcoming.
Organizational and Financial Viability of Management Turnover to Farmer Organizations under a Joint Management Model.

Kloezen, Wim. Forthcoming.
Case study of tubewell turnover histories in Bangladesh.

4.4 International Conference on Irrigation Management Transfer

Technical editing by IIMI has been completed on the 32 Conference papers which were selected for inclusion in the selected proceedings publication. These have been sent to FAO in Rome which will produce and disseminate the publication by 30 April 1995. Drs. Vermillion and Johnson are currently preparing an overview and synthesis paper for inclusion in this volume. This will be completed and sent to FAO by 15 February 1995.