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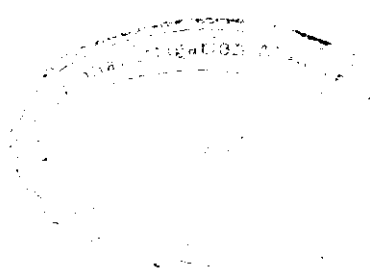
**RECOMMENDATIONS FOR CONSIDERATION
IN THE DEVELOPMENT OF
NEPAL'S IRRIGATION MASTER PLAN**

**PART 1. Management of Irrigation Systems for Effective
O&M and Resource Mobilization**

PART 2. Farmer-Managed Irrigation Systems

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Presented at the Irrigation Sector Coordination Meeting
held in Kathmandu, Nepal
on 23 February 1988



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Summary: This Occasional Paper presents recommendations for improving the effectiveness of operation and maintenance of agency-managed irrigation systems and for providing effective assistance to farmer-managed systems in Nepal. The paper sets out a series of recommendations with supporting arguments. These recommendations were discussed at an Irrigation Sector Coordination Meeting held in Katmandu, Nepal, on 23 February 1988. The meeting was convened by the Ministry of Water Resources and was attended by representatives of a number of government departments and international donor agencies.

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TABLE OF CONTENTS

PREFACE

PART 1. MANAGEMENT OF IRRIGATION SYSTEMS FOR EFFECTIVE O&M AND RESOURCE MOBILIZATION.....	1
IMPORTANCE OF EFFECTIVE MANAGEMENT AND O&M OF IRRIGATION SYSTEMS	2
RECOMMENDATIONS FOR ORGANIZATION AND MANAGEMENT OPTIONS.....	2
RECOMMENDATIONS FOR O&M IN JOINTLY MANAGED SYSTEMS	5
RECOMMENDATIONS FOR RESOURCE MOBILIZATION IN JOINTLY MANAGEMENT SYSTEMS	8
PART 2. FARMER-MANAGED IRRIGATION SYSTEMS	10
IMPORTANCE OF ASSISTING FARMER-MANAGED IRRIGATION SYSTEMS.....	11
RECOMMENDATIONS TO GIVE APPROPRIATE RECOGNITION TO FMIS	12
RECOMMENDATIONS FOR PROVIDING ASSISTANCE TO FMIS.....	13
RECOMMENDATIONS FOR ADMINISTRATIVE REORIENTATION	15

PREFACE

This paper presents recommendations, with supporting arguments, for improving the effectiveness of agency-managed irrigation systems and for providing effective assistance to farmer-managed systems in Nepal. These recommendations were prepared at the request of the United Nations Development Programme office in Katmandu, for discussion at the Irrigation Sector Coordination Meeting held in Katmandu, Nepal, in February 1988. The meeting was convened by the Ministry of Water Resources and was attended by representatives of a number of government departments and international donor agencies.

The concept of a "master plan" for irrigation implies the identification and ranking of activities to be carried out. In its narrowest sense this would be interpreted as preparation and ranking of a list of potential projects to be implemented. However, if we accept that the primary purpose of developing irrigation systems is to increase agricultural production through *timely* and *reliable* water delivery to growing crops, then provision for effective management of the systems after they are constructed is of paramount importance and is an activity that must be considered in preparation of the plan.

Management of an irrigation system is extremely complex, involving management of personnel, information flow, various levels of decision making, accounting, and much more. In order to focus on practical issues that are fundamental for effective organization and management of irrigation, we have broken this agenda item into three tasks. The first task is to discuss a comprehensive legal framework for the organization and management of irrigation. The Water and Energy Commission (WECS) has prepared a paper for this. The second task is to look at the systems where the primary control or ownership lies with the government and recommend management considerations for effective operation and maintenance, and resource mobilization for such systems.

The third task is to look at systems where the primary control is with the farmers and suggest considerations for providing them with effective assistance.

This paper sets out a series of recommendations with supporting arguments. A summary list of recommendations is given at the beginning of each section (pages 1 and 13, respectively) and then followed in subsequent pages by brief elaboration of each point. Many of the recommendations will require further examination and development. In some cases, special studies should be conducted to investigate the suitability of the recommendation and to make appropriate adaptations.

PART 1. MANAGEMENT OF IRRIGATION SYSTEMS FOR EFFECTIVE O&M AND RESOURCE MOBILIZATION

THESIS: Operation and maintenance (O&M) and the organizational structure needed to improve O&M should be a major focus of the master plan.

In the development of the master plan for the irrigation sector, policies and procedures for the following recommendations should be investigated and formulated. Elaboration of each recommendation is found in the following pages.

RECOMMENDATIONS FOR ORGANIZATION AND MANAGEMENT OPTIONS

1. Increase farmer participation in joint management of large systems, and insure that agency staff and farmers each have specifically defined O&M tasks.
2. Turn over ownership and management of small systems to farmer organizations.
3. Shift from an administrative to a management mode in large systems.

RECOMMENDATIONS FOR O&M IN JOINTLY MANAGED SYSTEMS

4. Routine maintenance should be considered a part of operation and separate from emergency or catastrophe maintenance.
5. A mobile team and a centrally-funded budget should be established to respond to catastrophes.
6. Farmers should be given the major responsibility for O&M.
7. Effective farmer organizations need to be formed, including a federation of field channel groups at the sub-system and system levels.
8. Define the water allocation and monitor the water distribution system as a management tool as well as the basis for mobilizing resources from farmers.

RECOMMENDATIONS FOR RESOURCE MOBILIZATION IN JOINTLY MANAGED SYSTEMS

9. Cost of O&M should be borne by the beneficiaries.

10. All payments made by farmers should be locally retained for use in the system in which they are collected.
11. Farmers should have the option of making payments in cash or in-kind.
12. All accounts and transactions should be open for inspection by farmers and agency staff.

IMPORTANCE OF EFFECTIVE MANAGEMENT AND O&M OF IRRIGATION SYSTEMS

The main objective of irrigation is to increase agricultural production through the timely and reliable supply of water. This will only happen if systems are effectively operated and maintained. Improved O&M should be emphasized for existing systems and be a major consideration in the planning and designing of new systems. Management determines O&M procedures at the local level, so the questions of who is managing the system and the stake that management has in the performance of the system are important considerations.

While there have been few comprehensive studies which have evaluated irrigation system performance in Nepal, it has been observed that existing systems are neither irrigating the full area for which they were designed nor achieving the cropping intensities and yields anticipated. This is *believed* to be due to poor O&M of the systems; a result of insufficient O&M budgets, lack of effective farmer organization and participation, and agency staff with inadequate management training. In some cases the low level of system performance may be a result of poor design and construction. (Performance evaluation based on design expectations may not be appropriate because insufficient data for design has resulted in unrealistic estimates of area to be irrigated.) Thus, to achieve the desired results from past and future investments in the irrigation sector, it is essential to improve the management of existing systems and to consider how the system is to be operated and maintained when planning and designing new systems.

In determining ways to improve the O&M of systems, the following recommendations should be considered under the master plan. The recommendations are not all ready for implementation, but will require further examination and development. In some cases, special studies should be conducted to investigate the suitability of the recommendation and to make appropriate adaptations.

RECOMMENDATIONS FOR ORGANIZATION AND MANAGEMENT OPTIONS

1. Increase Farmer Participation in Joint Management of Large Systems and Insure that Agency Staff and Farmers Each Have Specifically Defined O&M Tasks

Participation of farmers in the O&M of irrigation systems through structured water users' associations is essential for effective management. Specific O&M tasks can be turned over to

farmer associations in a system jointly managed by the irrigation agency and farmers. Along with responsibility for maintenance, farmers must have a role in making decisions concerning operation of the system.

User groups that have been formed have often been limited to participating in O&M at the field channel level. However, it has been observed in other countries that when farmer organizations are involved at higher levels of the system, management is more effective. While farmer organizations will be wholly responsible for O&M at the field channel level, at higher levels responsibility will be jointly shared by the agency and the farmers. System level and sub-system level committees comprised of agency staff and farmer representatives should be formed to make decisions concerning system O&M.

Activities are needed to strengthen farmer organizations and to train agency staff for collaboration in management with farmers. The use of association organizers (AOs), like those introduced under the Irrigation Management Project of DOI, has been a successful means of strengthening farmer organizations and fostering better farmer-agency relationships in several countries. AOs have been trained to assist formation of irrigation user groups. They live with the farmers of an irrigation system and assist in establishing effective communication between the agency and the farmers. Training courses -- both for farmers and agency staff -- conducted by the Irrigation Management Centre need to focus on issues that will assist in implementation of a greater degree of joint management.

Implementing effective joint management of irrigation systems may also require some changes in the irrigation agency as well. The National Irrigation Administration in the Philippines found that when it wanted to increase farmer participation in system management, it was necessary to make some changes in its internal organizational structure, management procedures, and staffing. For instance, an Institutional Development Division was added to facilitate the development of farmer organizations.

2. Turn Over Ownership and Management of Small Systems to Farmer Organizations

In Nepal, there are thousands of irrigation systems which were built and are operated by farmer organizations. Several studies have documented the farmers' capacity to operate and maintain these systems and to upgrade them continually, enabling highly productive irrigated agriculture. Although most of the systems are small -- serving less than 100 hectares (ha) -- there are examples of farmer-mgded systems which irrigate more than 5,000 ha. The Department of Irrigation (DOI) also is responsible for the management of many small systems in isolated areas scattered across Nepal. Of the approximately 92 systems constructed and managed by DOI, 44 or nearly half have proposed command areas of less than 200 ha. It is certainly within the capacity of the farmers to

operate and maintain many of these systems. If DOI were to turn over the management of these systems to the farmers, it could then concentrate greater effort in the larger systems.

Initially there should be a study to determine the feasibility and likely impact of the turnover of small systems to farmer organizations. How many systems would be candidates for turnover? How many DOI staff would be available for reassignment to other systems? What would be the budgetary implications of turnover? What would be the expected impact on the performance of these systems?

A program to turn over small systems to farmer organizations should begin with a small action research project. To develop and test procedures and policy, several systems should be selected and turnover implemented. This entire process should be documented and evaluated. Since farmers in systems built and operated by the DOI have no experience in managing the whole system, the program will need to include activities to form or to strengthen farmer organizations, or both. Employing association organizers (AOs), as in the Irrigation Management Project, could be considered. Another activity would be for farmers from the system selected for turnover to visit well-managed farmer systems. Farmers interacting with other farmers who have years of experience in operating and maintaining their own system is an excellent way to learn effective management procedures and organizational forms.

The remainder of Part 1 will address issues related to the joint management of irrigation systems by DOI and farmer organizations. Issues concerning farmer-managed irrigation systems are discussed in Part 2.

3. Shift from an Administrative to a Management Mode in Large Systems

Many irrigation systems are "administered" rather than "managed." Administered systems are operated according to a prescribed set of plans and procedures usually formulated in a central office. Such plans and procedures do not lend themselves to consideration of physical, environmental, and socio-cultural differences among systems nor the short-term changes in conditions within systems. When a system is managed, the system performance and environmental conditions are monitored, and the information that is fed back to the managers is used to adjust the operation.

There should be an investigation to determine the extent to which this is an issue. How are systems being operated now; are they administered or managed? For responsive management to be effective, more accurate and timely information than is routinely collected and analyzed in many administered irrigation systems is required. Irrigation agencies rarely have the resources to collect and analyze these data themselves. Farmers will often be in a better position to supply information, pointing again to the need for farmers' participation for a responsive, well-managed system.

RECOMMENDATIONS FOR O&M IN JOINTLY MANAGED SYSTEMS

4. Routine Maintenance Should be Considered a Part of Operation and Separate from Emergency or Catastrophe Maintenance

The task of repairing the diversion structure, gates, cross regulators, and escapes; the desilting and weeding of canals; and other maintenance activities that must be done on a regular basis should be considered part of the operation of the irrigation system. Since these tasks are virtually the same year after year, plans and budgets for them can be easily prepared. Procedures need to be established for each system that enable these tasks to be performed properly and in time, to allow effective operation of the system. The repair of catastrophes caused by unusual and unexpected events such as landslides and destructive floods must be handled differently since the frequency is much lower and often the magnitude of the effort required to rectify the problem is much greater.

This is analogous to the operation of a vehicle. Adding fuel, timely lubrication, repair of punctures, replacing broken lamps and fuses are essential for a safe and comfortable ride and are usually paid for from the operating budget for the vehicle. Since these events happen more or less regularly, the driver is usually responsible to see that they are attended to. If reliable performance from the vehicle is expected, the driver must monitor the status of each essential part and repair, replace, or refill at the appropriate time. The driver will develop procedures for doing this and have resources made available to perform the routine maintenance.

However, a broken engine crankshaft is a catastrophe that must be repaired before the vehicle can run again. This type of repair is usually beyond the capacity of the driver. Specialized technical expertise and additional parts must be sought. It would be unusual for the driver or owner to be a mechanic as well, or to have a spare crankshaft available for replacement.

It is critical to make sure that routine maintenance is regularly done to certain vital structures such as escape gates, to protect the security of the headworks. While many catastrophes are a result of natural calamities, others are due to human negligence. The farmer organization and agency staff will have to work out procedures to insure that this important maintenance is carried out without fail.

5. A Mobile Team and a Centrally-funded Budget Should be Established to Respond to Catastrophes

It cannot be predicted when an emergency will strike a particular irrigation system. However, that each year in some system a landslide will occur is almost certain, and there should be a well developed support system to deal with it promptly.

The vehicle analogy is useful here again. In the same way that it is not cost effective for each vehicle owner to stock an extra crankshaft, each irrigation system should not be required to stockpile materials or even to budget for total coverage of emergency repairs. Prompt and effective repair of the crankshaft is usually determined by the availability of technical expertise, spare parts, and cash to pay for both. If there is a good support system with trained manpower and well stocked spares it is more likely that such a repair can be effected promptly.

A mobile team of experts should be established that can be dispatched immediately to the site of a disaster to assess the extent of need for emergency repair. Together with the management personnel of the irrigation system, they should design the repairs, prepare the budget, and establish the process for carrying out the work.

A common problem impeding quick repair of systems after catastrophic events is the long time required to get resources allocated for the emergency repair. In the annual budgetary process there should be a reserved (unforeseen) fund allocated for emergency maintenance in the irrigation sector. The mobile team should have the authority to draw on this fund, up to a reasonable limit, before a detailed budget for the emergency maintenance has been completed and approved. This will allow work to begin to get the system operating as soon as possible to minimize crop loss.

Initially, the emphasis should be on doing only what is necessary to restore operations as soon as possible. The budget for this maintenance work should be prepared by the mobile team in consultation with local agency staff and the farmer organization, reviewed, and approved as quickly as possible. Permanent repairs following a catastrophic event will often take longer and will likely need to be postponed until the next construction season.

6. Farmer Organizations Should be Given the Major Responsibility for O&M

Each irrigation system should plan to deal with the routine maintenance events from their own resources which they control and implement. Desilting and cleaning of canals, and minor repairs to gates and other structures are maintenance tasks that farmer organizations can do, sometimes under the supervision of the agency staff. In some cases, there may be reasons to award contracts for certain jobs. The farmer organization should help make the decision whether to contract the work. It should also be eligible to bid on the contract and should help decide to whom to award the contract.

The farmer organization should also participate in decisions regarding operation of the system. Farmers, more than anyone else, stand to gain or lose by how the system is operated. If, as is recommended below, the farmers are to be responsible for the cost of O&M, it is only fair that they have a major share in decisions about operations.

7. Effective Farmer Organizations Need to be Formed, Including Federation of Field Channel Groups at the Sub-system and System Levels

Without an organization, it will not be possible for the many small farmers to operate and maintain an irrigation system effectively. In some systems water users' groups have already been formed at the field channel level. Since it is recommended that farmers be given the major responsibility for O&M, it will be necessary to federate these groups at higher levels in the larger systems.

To form a multi-tiered farmer organization capable of assuming major responsibility for system O&M will require considerable effort in group organizing. There is experience in other Asian countries which can be drawn upon in doing this. The Irrigation Management Project is engaged in developing more effective farmer organizations through the use of AOs. The efforts of this project should be supported and adapted in forming strong farmer organizations.

Effective three-tiered organizations are found in some of the larger farmer-managed systems in the Tarai. These systems are excellent examples of how farmers can be effectively organized for irrigation management. Farmers from these systems can, with proper guidance, be trainers for both farmers and agency personnel, or travel to other systems as consultants to assist in promoting and establishing organizations.

8. Define the Water Allocation and Monitor the Water Distribution System as a Management Tool as well as the Basis for Mobilizing Resources from Farmers

An important feature of farmer-managed systems that perform well is a precisely defined water allocation principle. They make a careful definition of individual farmer water rights in both quantity and timing of access to the available irrigation water. Before planting each crop an agreement is made by the beneficiaries on who will have access to what proportion of the water in the system. Irrigation water distribution is then monitored throughout the season to assure that the individual farmer's allotment is being met and that individuals do not take more than their share. A second important reason for careful definition of water allocation to the individual farm or farmer is that this also defines the responsibility for resource mobilization.

Methods need to be devised to allocate water to individual farms in large, jointly managed systems. Farmer cooperation and agreement to the allocation is more likely if they take part in the decision making. This is another important task of the user organization that requires representation at all levels of the system. Monitoring the actual water distribution in the system will indicate if the system is performing according to the allocation plan and give feedback to the management for modifying the distribution. Farmers can only be expected to contribute resources to O&M if they receive the water to which they are entitled.

RECOMMENDATIONS FOR RESOURCE MOBILIZATION IN JOINTLY MANAGED SYSTEMS

A discussion of O&M cannot be divorced from consideration of how resources will be mobilized to carry out O&M activities. In many countries, mobilizing sufficient resources for O&M is becoming increasingly difficult. As the area irrigated has increased with the large investments in construction in the past two decades, the amount of resources available for O&M have declined when computed on a per hectare basis.

New, more effective means of resource mobilization must be found. The institutional arrangements for mobilizing resources should be examined. These arrangements affect the incentives for the agency to provide quality O&M and the willingness of farmers to participate in O&M through labor contributions and fee payments. Evidence from several countries has shown that irrigation agencies with a significant amount of financial autonomy are more concerned with providing better irrigation service to enable higher fee collection rates.

9. Cost of O&M Should be Borne by the Beneficiaries

Due to serious financial constraints, the central government is limited in the amount of resources it can make available to DOI for O&M. Thus, farmers who benefit from irrigation systems constructed by the government should bear full responsibility for system O&M. A study of several Asian countries, including Nepal, has concluded that, under conditions of good irrigation service, farmers are capable of paying the full cost of O&M out of the incremental benefits of irrigation. Several studies of farmer-managed irrigation systems in Nepal have shown that farmers are willing to contribute significant amounts of labor and cash -- the equivalent of NRs 500-700/ha (US\$23-33/ha) -- to operate and maintain their systems.

Much of the O&M involves labor, but some material resources are also needed in most systems. In addition, the salaries of agency staff must be paid. Farmers can use their labor to do some of the maintenance work and can contribute cash to cover the rest of the cost of O&M. The O&M work to be done and the mix of farmer labor and cash payments should be decided in discussions between the local agency staff and the farmer organization. The amount of labor and cash required for O&M will vary among systems as a result of different environmental conditions and the farmer organizations' decisions regarding the mix of cash and labor to contribute.

In the event of a catastrophe, farmer organizations should be expected to mobilize quickly the large amount of labor needed to begin repairing the system immediately. Cash needed in such cases should be provided by the central budget reserved for emergencies.

10. All Payments made by Farmers Should be Locally Retained for Use in the System in Which They are Collected

If there is no relationship between the amount that farmers pay and the resources available for O&M of their system, farmers have little incentive to pay fees. Farmers are more willing to make cash payments if they know the money will be used in the O&M of their system rather than sent to the central treasury. (Farmers in farmer-managed systems in Nepal have been observed to make sizeable cash payments to repair and improve their systems.) There will also be more incentive for the local agency staff to provide good service if the size of its budget is largely dependent on the amount it collects from farmers. This provides an important degree of accountability of the agency staff to the users.

11. Farmers Should Have the Option of Making Payments in Cash or In-kind

To encourage payment of cash assessments, farmers should have the option of paying the fee in cash or in-kind. In the Philippines and Korea fees are denominated in kilograms of rice, and farmers can make their payment in cash or in-kind. The official government rice price is used to convert the fee in kilograms of rice into cash. The farmers' decision whether to pay in cash or in-kind depends on the market price of rice relative to the official price. By denominating the fee in a quantity of rice, in times of inflation, the agency is protected from the politically difficult problem of having to raise the fee frequently or see the real value of the fee decline drastically.

12. All Accounts Should be Open for Inspection by Farmers and Agency Staff

Farmers will be more willing pay irrigation service fees if they are convinced that the money will be used effectively for O&M of their system, and will not be misappropriated. In many farmer-managed systems, the accounts are reported at a meeting of the members of the organization, and in some an audit committee is appointed to examine the accounts. Reporting the amount of the O&M budget and the details of expenditures will demonstrate to the farmers that the money has been used for legitimate expenses and will make the agency accountable to its clients.

PART 2. FARMER-MANAGED IRRIGATION SYSTEMS

Since irrigation systems constructed, operated, and maintained by farmers account for the major portion of irrigated agriculture in Nepal, the irrigation sector master plan should address the needs of this part of the sector. The following are recommendations for consideration concerning farmer-managed irrigation systems (FMIS). Elaboration on each recommendation is found in the following pages.

RECOMMENDATIONS TO GIVE APPROPRIATE RECOGNITION TO FMIS

1. Provide legislation that establishes the legal identity and rights of the beneficiary groups operating irrigation systems.
2. Identify existing FMIS in the area of each new agency project and incorporate their physical and organizational structure into the system with minimum disruption.

RECOMMENDATIONS FOR PROVIDING ASSISTANCE TO FMIS

3. Establish uniform assistance policies for each geographical region of the country.
4. Systematically identify all FMIS in the country on a watershed basis by making an inventory that establishes a database giving pertinent details about each system.
5. Establish criteria for selecting systems for assistance.
6. Enable beneficiaries to improve the effectiveness of O&M activities in their system and to participate fully in any physical improvements that are made by providing assistance in strengthening their organizational and management capacity.
7. Beneficiaries should be encouraged to take responsibility in assisting with selection of the design and in implementation of physical improvements that are to be made to their system.
8. The design process for improvements to FMIS should be simple and field based.

RECOMMENDATIONS FOR ADMINISTRATIVE REORIENTATION

9. Assistance to FMIS should be in the form of loans (subsidized to the extent necessary) instead of grants.

10. A division responsible for assistance to FMIS should be established in the Department of Irrigation (DOI).
11. All levels of DOI staff dealing with FMIS need orientation and training to enable them to implement a participatory approach to assisting these systems.

IMPORTANCE OF ASSISTING FARMER-MANAGED IRRIGATION SYSTEMS

In the past ten years awareness of the scope of FMIS in Nepal and the contribution these systems make to the national economy has been increasing. These systems are spread over all districts of the country and range in size from less than 1 ha to the federation of systems, managed by a central committee, covering more than 15,000 ha.

The total number of systems is unknown. Extrapolated information from a detailed inventory of one river basin in a hill district and land resource maps indicates there are likely over 17,000 FMIS in the hills. Inventories of all the Tarai districts identified over 1700 farmer-managed systems in that region providing some level of irrigation to at least 450,000 ha.

These systems and the farmer organizations which operate and maintain them are a unique national resource which must be preserved and improved. By a conservative estimate, the production from farmer-managed irrigation systems is feeding 30% of Nepal's population.

Farmer-managed irrigation systems in Nepal present a wide variation in the type of organization and management style, methods of both internal and external (to the system) resource mobilization, water allocation, water distribution, and maintenance practices. Each FMIS has a distinct character which is determined by adaptation to the environment and the needs of the people it serves. In most systems the low quality of physical structures is compensated for by careful management of the available human resource.

While some of these systems are well managed and achieve a high level of agricultural production, many systems could benefit from assistance from the Department of Irrigation (DOI). In both the hills and Tarai, farmers are facing increasing difficulty in operating their systems due to deforestation and government policies protecting forests that have traditionally provided the materials necessary for maintenance.

The contribution of FMIS to satisfying the basic needs of the rural population is already high but can be increased further. The unique resource of human organization and extremely diverse physical infrastructure represented by FMIS should be preserved and assisted in developing further. In determining ways to improve the functioning of FMIS and to devise appropriate ways to assist them, the following recommendations should be considered under the master plan.

RECOMMENDATIONS TO GIVE APPROPRIATE RECOGNITION TO FMIS

1. Provide Legislation that Establishes the Legal Identity and Rights of the Beneficiary Groups Operating Irrigation Systems

At present, the farmer organizations managing irrigation systems have no clear legal status. This makes it difficult for them to mobilize resources external to their organization. For example, it is difficult for banks to give loans to a group of farmers to make improvements in their system. Frequently hundreds, even thousands of families, are members of the association, with their own "formal" rules and regulations for O&M of a system. However, these associations of farmer irrigators are informal in terms of legal rights. They should be able to register their association and receive rights over the water which they are using and be able to deal with banks and government agencies as a formal enterprise.

2. Identify Existing FMIS in the Area of Each New Agency Project and Incorporate their Physical and Organizational Structure into the New System with Minimum Disruption

Whenever a new irrigation project is proposed, one of the first steps should be to identify all of the existing FMIS in the projected command area. To insure this, the terms of reference (TOR) of the consultants or agency staff that does the preliminary investigation should require an inventory of the existing FMIS in the project area. For each system, they should report the name, location, water source, estimated area irrigated, cropping pattern, water rights among systems, number of farm households in the association, and method of water allocation among users for each crop.

For a subsequent feasibility study the TOR should call for detailed information about the existing management, O&M procedures, and production of each system. A requirement for approval to proceed to a design study for a new system should be a clear indication that irrigation services will actually improve in the areas already served by FMIS and that incremental increase in agriculture production of the improved service and expanded area will justify the cost of the project. This requires that careful consideration be given to the water rights of existing systems and discussion with present and potential beneficiaries to determine the level of cooperation there will be in expanding irrigation services.

The TOR for the design study should request details on how the existing systems and their organization will be incorporated into the new design. To the extent possible with the given topography, the farmers' distribution systems should be kept intact to cause the least disruption to the association's organization and management capacity. One way of doing this is to augment the supply at the headworks of the existing system, and continue to use the existing distribution network. It may be necessary to make improvements to the headworks and within the distribution system, but this should be done in the spirit of assisting a farmer-managed system instead of overlaying it with a completely new design.

If the existing farmer organizations are effective, they should not be forced to adopt some rigid standard format but should be allowed to retain their own organizational form and management procedures. Weaker organizations should be strengthened as a part of the assistance effort. This effort should start with the experience and capacity that farmers already have and build on their existing rules and methods rather than introduce a standard water users' association format which may be incompatible with local conditions.

RECOMMENDATIONS FOR PROVIDING ASSISTANCE TO FMIS

3. Establish Uniform Assistance Policies for Each Geographical Region of the Country

Previously, four agencies were involved in providing assistance to farmer-managed irrigation systems. Each used different policies and strategies for implementing their programs ranging from 100% subsidy and little participation to significant contribution and participation by the beneficiaries.

Since all irrigation development activities have come under one umbrella, a uniform policy, at least on a regional basis, will need to be applied. This policy should be formulated only after a careful study of the past experience of all of the agencies has been completed. The study should include field investigation to determine the impact the different levels of beneficiary input under various programs have had on the O&M of systems and ultimately on agricultural production. The study should also examine the strategy each program used and recommend the most cost effective and viable implementation procedures.

4. Systematically Identify All FMIS in the Country on a Watershed Basis by Making an Inventory that Establishes a Database Giving Pertinent Details About Each System

Comprehensive planning for improving the performance of FMIS cannot be done without detailed information about the status of individual irrigation systems. An inventory should be prepared by systematically investigating each watershed in a district to generate the first level of this information. Using the watershed as the basis of investigation allows clustering of systems that are related to each other with respect to water rights.

The inventory should identify all systems in the watershed with information such as: a) the name of the system and source, b) location, c) irrigated area, d) number of households using the system, e) extent of land and water resources utilization (How much cultivated land is unirrigated under the command of each canal? Is there water in the source that is not utilized?), and f) problems of operating the system identified by the beneficiaries. Preparation of the inventory work should include establishment of a database for easy retrieval of information and modification and updating as assistance is given to specific systems.

5. Establish Criteria for Selecting Systems for Assistance

The inventory information should be used to identify systems where assistance is most needed and will be most beneficial. The criteria for selecting systems for further investigation and ultimately to assist should include: a) potential for expanding the irrigated area, b) opportunity to intensify the cropping pattern by better water delivery, c) willingness of the beneficiaries to invest a specified proportion of the improvement cost and to add new members to their association in return for their assistance in making improvements and in O&M, and d) opportunity to reduce the maintenance cost of the system.

6. Enable Beneficiaries to Improve the Effectiveness of O&M Activities in Their System and to Participate Fully in any Physical Improvements that are Made by Providing Assistance in Strengthening their Organizational and Management Capacity

After a system is selected for assistance, there should be an in-depth investigation to determine the existing management capacity of the beneficiaries. This should include the rules, roles, methods of conflict management, and records that they keep as well as the extent and method of resource mobilization for routine and emergency maintenance. Where improvement in their management capacity is necessary, existing practices should form the foundation for expanding their expertise.

The use of association organizers, farmer consultants with experience from well-managed irrigation systems, and training programs that include field visits to other systems where different practices are used are several methods that could be used to strengthen management capacity.

7. Beneficiaries Should be Encouraged to Take Responsibility in Assisting with Selection of the Design and in Implementation of Physical Improvements that are to be Made to Their System

The farmers themselves are the best source of information about crop preferences, soil conditions and variation over the area, stream flows, and stability of land forms, and they can provide this input to the planning and design process.

Where cadastral surveys have been completed, farmers can assist in compiling accurate area estimates of the existing and potentially irrigated area to be used in designing the canal. In a "walkthrough" of the system, the beneficiaries can quickly point out the difficulties and bottlenecks in the system and priorities for necessary improvements. The management capacity of the beneficiaries will be reinforced if they are encouraged and assisted to share responsibility for the planning, design, and implementation of physical improvements.

8. The Design Process for Improvements to FMIS Should be Simple and Field Based

Where assistance is being given to upgrade existing structures that typically carry a discharge of

less than 100 liters/second (l/s) and seldom more than 300 l/s, the lengthy process of topographic field survey, office design, and carefully inked drawings greatly delays the implementation process and is not cost effective. Procedures need to be developed (and where possible adapted from the past experience of the various agencies that had been assisting FMIS) to simplify the design process to make it prompt and less costly.

Where rock cutting is required or simple structures are to be improved, accurate sketches in a fieldbook and analysis of costs should be prepared on-the-spot. If the beneficiaries are to contribute to the cost of the improvements and operate and maintain them in the future, they should help select among alternative designs and set the priorities for making improvements.

RECOMMENDATIONS FOR ADMINISTRATIVE REORIENTATION

9. Assistance to FMIS Should be in the Form of Loans (subsidized to the extent necessary) Instead of Grants

Assistance to FMIS should be in the form of loans, not grants. The loans could be subsidized by the government, but the principle that the farmer organization pay for a significant proportion of the investment is important. If this is the case, the organization will set priorities according to what will really benefit them in terms of improved performance or reduced maintenance cost or both. The organization should decide how much of the cost of the project it wants to pay for with its labor and how much in materials and cash. There should be a means by which the organization as a whole can take a loan for the cash investment if necessary.

10. A Division Responsible for Assistance to FMIS Should be Established in the DOI

The approach and necessary manpower for assisting existing FMIS is sufficiently different from the design and construction of new systems that a separate division is warranted. It should be the responsibility of this division to formulate policies and procedures and to provide overall guidance in assisting FMIS. The division should consider the importance of both physical and "non-physical" assistance to FMIS and employ personnel qualified, trained, and interested in working with farmer groups.

11. All Levels of DOI Staff Dealing with FMIS Need Orientation and Training to be Able to Implement a Participatory Approach to Assisting these Systems

Assistance to FMIS is a shift from considering primarily design and construction issues in which DOI staff have considerable expertise. If the approach is to be predominantly participatory, the staff will need a new orientation that will require a substantial training effort. The training will require exposure to the farmer's point of view of the cropping pattern, water rights, and water requirements and must emphasize methods for organizing water users into effective management units.