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The third and final phase of the development process for improving irrigation water management of farms is called Project Implementation. This final phase consists of three subphases: (a) Project Authorization; (b) Project Organization; and (c) Project Operation. This manual describes the process of selecting which one of several solutions will be developed into a proposal for funding. The basic points about writing and negotiating a proposal are discussed. After authorization of the project, the next steps are designing the project's organization, and selecting and training the field staff. The benefits and means of achieving teamwork are emphasized. The project manager must prepare to accomplish the project's goals, and to establish linkages with organizations that will be affected by the project. This manual stresses the necessity of setting goals, and correcting the progress of the project through monitoring, evaluation, and refinement. To ensure that the improved on-farm practices will persist after the project finishes, the institutionalization of the project into the normal activities of the farmers' organization and the government extension service is discussed.

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Development Process for Improving Irrigation Water Management on Farms

# PROJECT IMPLEMENTATION MANUAL



Prepared by  
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Technical Report No. 65D

Development Process for Improving  
Irrigation Water Management on Farms

PROJECT IMPLEMENTATION MANUAL

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## CHAPTER I

### CHOOSING THE SOLUTION AND PLANNING THE PROJECT

This manual is the last in a series on the "Development Process for Improving Irrigation Water Management on Farms." The others are about: 1) the development process for the improvement of on-farm water management in irrigated agriculture; 2) the identification of on-farm water management problems; and 3) the development of solutions to the problems. The first manual presents an overview of the three phases in the development process. The Problem Identification manual described an approach to examining the plant environment, farm management practices, water supply and removal, and the institutional infrastructure. The end result of the Problem Identification process is a description of priority problems and their apparent causes. The Development of Solutions manual takes the findings from the Problem Identification process and discusses means of identifying plausible solutions, testing and adaption based on field work to develop solutions adaptable to the farmers' resources and acceptable to farmers, and assessment of solution packages in terms of technical, social, economic, and organizational feasibility.

The Project Implementation phase consists of three subphases: (a) Project Authorization; (b) Project Organization; and (c) Project Operation (see Figure 1). This manual describes the process of selecting which of several solutions will be developed into a proposal for funding. The basic points about writing and negotiating a proposal are discussed. After authorization of the project, the next steps are designing the project's organization, and selecting and training the field staff. The benefits and means of achieving teamwork are emphasized. The project manager must prepare to accomplish the project's goals, and to establish linkages with organizations that will be affected by the project. This manual stresses the necessity of setting goals and correcting the progress of the project through monitoring, evaluation and refinement. To ensure that the on-farm practices will persist after the project finishes, the institutionalization of the project into the

## PROJECT IMPLEMENTATION

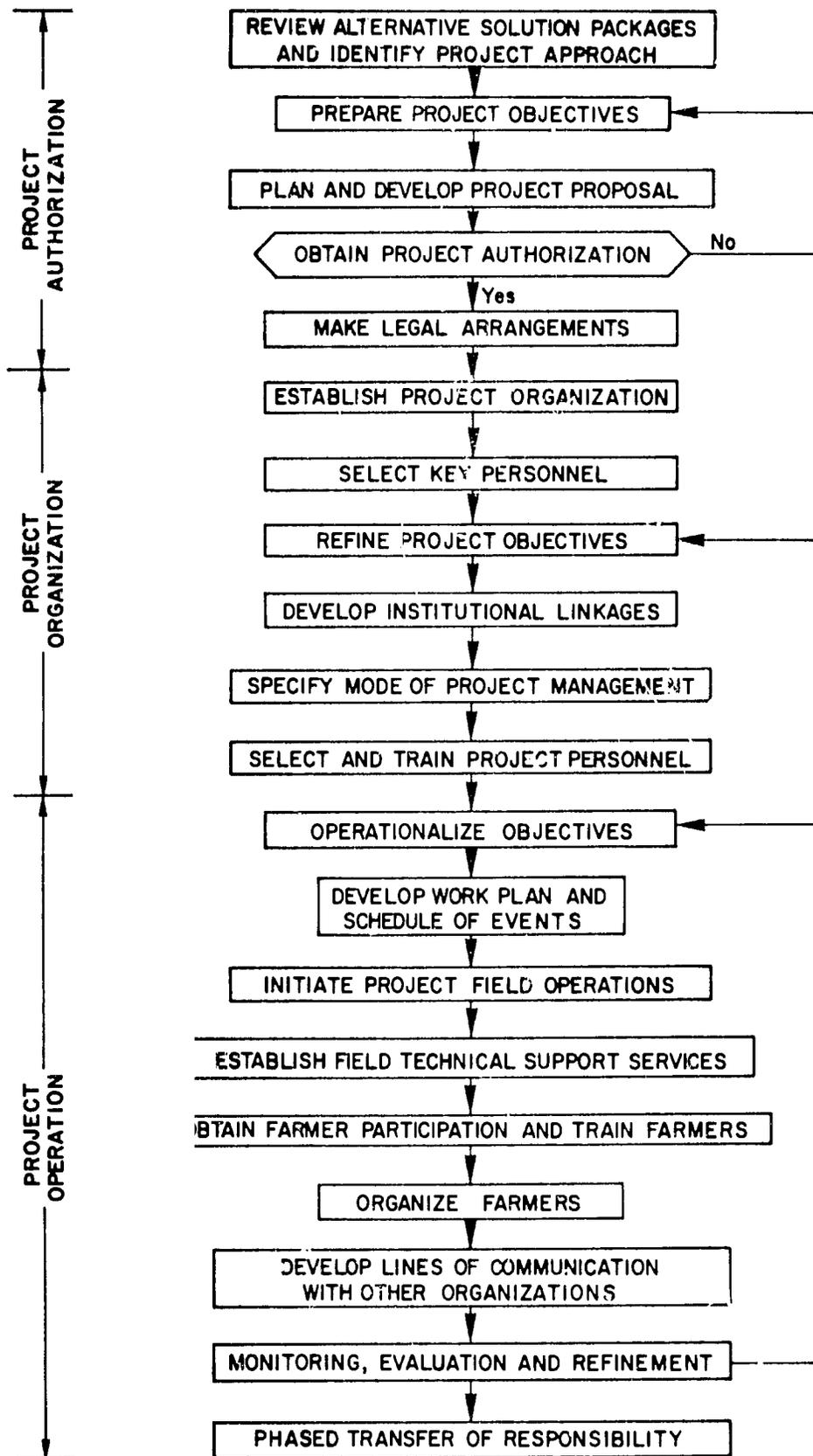


Figure 1. Flow diagram for the Project Implementation phase.

normal activities of the farmers' organization and the government extension service is discussed.

## CHOOSING THE SOLUTION

At the end of the Development of Solutions phase several alternatives should have been recommended for improving irrigated agriculture in the specified area. If the steps described in the other manuals of this series have been followed, the alternatives will have been tested on farms and evaluated according to technical, economic, social, and political factors. Then, the first step in the Project Authorization subphase (Figure 2) can occur.

Choosing the solution to be implemented involves political discussions at meetings of decision-makers. Besides technical personnel who did the preliminary studies, persons attending the meeting may include agency officials, donor representatives, local and regional politicians, farmer representatives, and other interested persons. These individuals will consider the solution from their own viewpoints, and the choice that is eventually made may reflect regional or national plans, political demands, and traditions, as well as immediate problems. While these considerations should have been made during the Development of Solutions phase, their relative importance is often overlooked until the meetings occur.

Since the choice of the solution will include factors in addition to technical analyses, technical personnel can use this knowledge to help define their contribution to the meeting. Technical personnel should present their data so they can be easily understood by nontechnical decision-makers and administrators responsible for the country's development and effective use of resources. Consideration should be given to having farmer representatives who participated in the Development of Solutions phase appear during part of these meetings. These representatives should be able to effectively describe in their language the impacts of the solution on their operations to nontechnical administrators.

A short summary should be included at the beginning of the written material for each alternative solution. Additionally, technical persons should prepare a summary comparing all of the alternatives. Comparisons of alternatives may consist of short summaries, outlines,

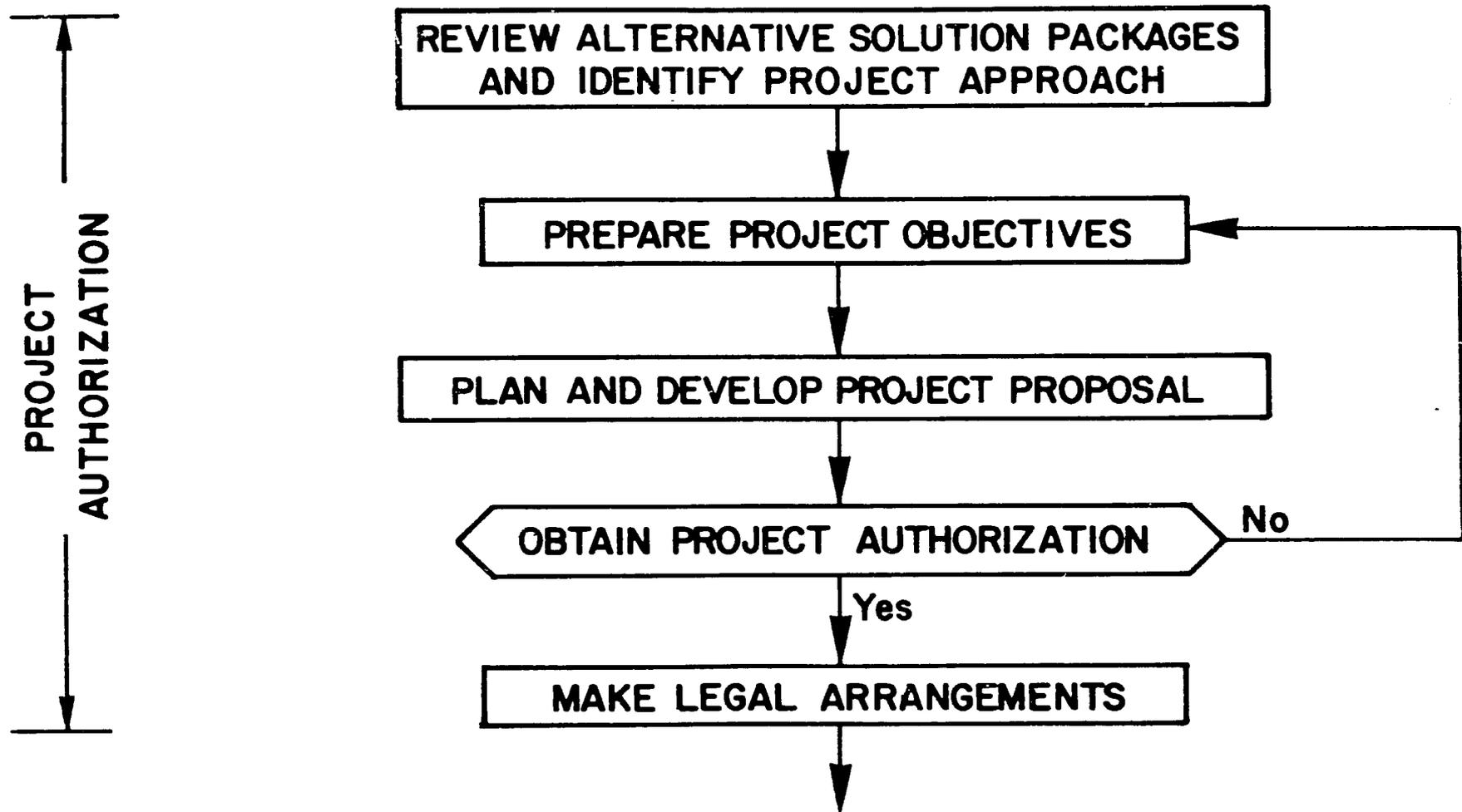


Figure 2. Flow diagram of activities in the Project Authorization subphase.

figures, tables, slides, audio tapes, and movies that help decision-makers comprehend the alternatives better than if only written material is used. In addition, a visit by the decision-makers to demonstration sites provides more visible evidence of the alternatives, while facilitating communication with more farmers.

The goal of these meetings is to choose the preferred approach to solve on-farm irrigation problems. This solution package must then be submitted as a project proposal for funding by the government, an external funding agency, or both, for those project costs that cannot be financed by farmers receiving the benefits of the proposed project.

### PREPARING THE PROJECT PROPOSAL

Persons who select the solutions may not be the same as those who prepare the proposal for submission to a funding source. It is likely that some of the technical people who did the preliminary research will help with the proposal, as will representatives from the sponsors of the project. The sponsors may be government agencies in the country of the project, and/or international donors such as the United Nations, the United States Agency for International Development (USAID), the World Bank, and the Asian Development Bank, among others. Some criteria for good proposals are listed in Table 1.

The proposal must be a clear, factual, and persuasive description of the suggested project that conforms to the sponsors' purposes. Material from the Problem Identification and Development of Solutions phases should furnish most of the information necessary to write the proposal, although material from other sources as well as additional analyses may be required. In general, the proposal should include nine major components as listed in Table 2.

#### Abstract

The abstract should be a concise description of the project's objectives, participating donors and organizations, clients, location, duration, and approach. The purpose of this abstract is to summarize the most important aspects of the project. It is essential the abstract be well written because many readers will not have time to carefully study the entire proposal.

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Table 1. Characteristics of a good proposal.

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1. Describes a favorable impact on problems
2. Clearly and concisely written
3. Supplies complete information
4. Shows that a competent staff can be assembled for the project
5. Lists a realistic budget with good methods of accountability
6. Includes a current literature review
7. Demonstrates responsible generalizations from the feasibility data
8. Provides a reasonable work plan
9. Describes what will be accomplished
10. Explains how errors will be minimized
11. Contains some new ideas

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Table 2. Components of a proposal.

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1. Abstract  
Short summary of the proposal.
2. Statement of the Problem  
Explains why the funding is wanted and what it will accomplish.
3. Objectives  
Lists what will be achieved and the result of the project if it is successful.
4. Procedures  
Describes how the results will be obtained.
5. Evaluation  
Shows how the project has met its objectives.
6. Dissemination  
Outlines the plan for spreading the effect of the project. Describes what groups of people will be directly and indirectly affected and how they will be reached.
7. Facilities and Equipment  
Details the facilities and equipment needed to successfully complete the proposed work.
8. Personnel and Training  
Specifies how many and what kinds of people possessing certain skills are needed; what specific training is required; and how and where this training can be obtained.
9. Budget  
Designates the amount of funding necessary for the project and how much of this cost can be financed by the impacted farmers, government, and donors.

### Statement of the Problem

The problem statement describes a condition that requires correction or improvements. It should consider the national, regional, and local development plans and the sponsors' missions. Some of the description can come from research on problem identification. However, the proposal will usually need additional information related to the specific project being suggested.

Descriptions of the missions of the sponsors along with preferred proposal formats can often be obtained from their instruction material on submitting a proposal. However, missions of sponsors often change and it may be useful for the proposal writers to meet with people in the sponsors' organizations to obtain their suggestions. Reading annual reports and newsletters, other proposals, and considering the sponsors' previous work will provide insights about developing a successful proposal. It also helps to contact other persons who have received funding from the same sources to learn about the sponsors' interests. In general, it is worthwhile to establish personal contacts with the sponsors' representatives rather than communicate only by mail or telephone.

An example of a sponsor's interests is contained in the USAID's project requirements for 1978. Projects funded by the USAID grants or loans were requested to "help the landless and rural poor; do area development planning; integrate approaches to health, nutrition, population, education, and human resources; and emphasize the role of human rights and women." The USAID also requires certain types of technical, financial, social, economic, environmental, and legal feasibility analyses. In addition, they require a "social soundness" analysis, a "mean-ends analysis," and the use of their "logical framework," terms used to describe studies that must be incorporated in the project. The USAID Project assistance handbook provides assistance for writing proposals to them.

The World Bank requires a different approach for preparing proposals, primarily because it lends money for development projects. It does, however, favor projects that help small farmers, tenants, landless labor, and women, and emphasizes production of basic food crops. The Bank works closely with several United Nations

organizations, mainly the Food and Agricultural Organization (FAO), and the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in the development and appraisal of projects. The FAO has a separate staff that works with the World Bank in project identification, project preparation, and appraisal of proposals, sharing costs with the Bank. The Bank, in turn, helps prepare, appraise, and administer projects for the United Nations Development Fund (UNDP). Because of these connections, the requirements for proposals to the World Bank and United Nations are similar, and the United Nations' Manual on economic development projects is a valuable source of information on project requirements. The approach of the World Bank in developing projects is outlined in Warren C. Baum's "The Project Cycle".

In describing the problem to be corrected, it may be useful to consider how its improvement will influence other national priorities such as health, income distribution, and use of labor. Within the agriculture sector, the proposal developers should analyze how the project will affect integrated rural development, diversification plans, agrarian reforms, high intensity cropping programs, and marketing and distribution of crops. Some of the less obvious effects of solving a problem should also be considered. Most effects of solving on-farm water management problems are beneficial, such as the informal training received by the farmers and others. However, there may also be adverse effects, such as the loss of trees required by watercourse straightening. Changes in established social and political arrangements may be adverse or beneficial and they should be anticipated in the proposal.

An important point to remember in describing the problem is that the farmers are the primary clients to be served by the project. If they do not positively benefit, it is unlikely the project will be successful. The farmers must be involved in the early stages of project development, even before the proposal is written, and they should participate in proposal preparation and implementation as well.

## Objectives

The objectives of the proposal derive from the project's purpose and they state the results that should be achieved as a consequence of funding the project. Most of the projects for which this manual is applicable require purposes that describe their relationship to the sponsors' missions and other vital development plans. Several kinds of projects can be utilized. Applied research projects can test innovations and monitor and refine approaches used in the improvement. Other projects may have basic research objectives that stress the formulation of knowledge which evolves into theories with results applicable at other locations. Another kind of project may demonstrate an improved method with the intent it will be adopted and thereby increase agricultural productivity. For this type of project, the purpose would be use of the recommended method by the clients after the project terminates. The purposes of any project come from a combination of political, technical, and social forces, but the proposal writers and project leaders must be specific and unanimous in defining the purposes of the project. In addition, farmers and others affected by the project should be involved in defining the purposes.

Depending on whether the project will implement an innovation, conduct an experiment, create a demonstration, or improve productive capacity determines the research methods to be utilized. This, in turn, helps define the objectives of the project which are the effects that occur because of what is accomplished. An objective is more specific than a purpose, and is defined as a change from some present state that should occur by a certain time. An example of a purpose for a project on improving grain production would be to "improve wheat production by small farmers." One objective would be to "increase wheat production in a specific geographic area by one metric ton per hectare by 1988." Objectives should be expressed as quantitatively as possible.

Objectives can be stated with varying degrees of specificity. The proposal writers should be responsible for stating the purposes and general objectives of the project so that donors understand what is expected. Also, it is important to state objectives clearly so that as project implementors change, they will have a common framework upon which to organize and evaluate project progress. As the project

progresses into implementation, the number of objectives will increase, become more specific, and include statements defining which project members will be responsible for specific jobs essential to attaining the objectives.

A common error for those writing objectives is to state them in terms of activities of the project employees. For instance, an objective might be to "increase wheat production by a certain amount over a certain time." That the project will "supply five pumps to each community to help the farmers irrigate their wheat," or that "the project staff will spend 100 days helping farmers irrigate their wheat correctly" should not be considered as objectives, but procedures required to attain the objective. The objective is the result and the procedures required to attain them should be kept separate in the proposal. Only in a few special cases can the procedures be the objectives and these exceptions will be discussed later.

The proposal should describe only the general project objectives, leaving some flexibility for the implementation leader to develop more specific field operational objectives while matching capabilities of project personnel to specific jobs. The capabilities of the staff are often unknown when the proposal is written.

Major project objectives must be realistic if they are to be achieved. A factor in the disintegration of some projects has been unrealistic goals that forced project personnel to either sacrifice the quality of the program to meet quantitative production goals or to falsify reports to show more accomplishment than was achieved. To remedy such problems, opportunities for assessment and revision of goals should be provided during implementation, recognizing that more realistic assessments of possible goal attainment can be considered once the project is under way.

### Procedures

The procedures describe the approach that will be used in achieving the objectives. It should state whether the proposed project is experimental, pilot, demonstration, problem-solving, or a combination. The scope of the project which details location, clientele, and the organizations involved should be specified. Usually, the

procedures can be based on the findings of the Problem Identification and Development of Solutions phases, and on the project objectives.

Analyses conducted in the Development of Solutions phase concerning technical, economic, commercial, financial, management, political, organizational, and social feasibilities should identify the constraints of the project and help define the procedures and scope of work that will be attempted. If feasibility data are not available, it may be necessary for the proposal writers to obtain these data themselves. In most cases, the sponsors will require information indicating the feasibility of the project.

Technical feasibility analysis should answer questions about the validity of the project; rationale for choosing the project location; availability of skilled manpower, materials, and services for doing the project, changing requirements or demands for resources during different phases of the project; and the potential adaptability of different technologies. These analyses should identify any uncertainty associated with various components of the project. From this information, alternatives can be outlined should the recommended approach be unfeasible. Questions about waterlogging, salinity, disease control, erosion, and other environmental concerns should be covered in this section.

Economic feasibility is determined by the priority of the project objectives within the agricultural sector along with the general economy, contributions of the project to the economy, and actual costs as compared to the benefits. Relevant data dealing with these issues may have been assembled previously in the statement of the problem. The question about economic feasibility that should be answered is "What difference would it make to the economy if the project were done?"

Commercial feasibility is determined by assessing the ease of obtaining production equipment and supplies (the potential for developing local suppliers of essential components at reasonable cost), demands for additional crops, supply of farm labor, and transportation required by the project. Marketing and distribution problems are also analyzed in this section.

Financial feasibility is determined by estimating costs of the project as they relate to the financing plan, availability of funds in the present and future, potential revenues and profits from the project, level of

subsidies needed, adequacy of returns to the farmer to repay loans, kind of credit available to the farmers, and incentives required to motivate farmers to participate in the program. These analyses should describe the scheduled use of funds during the project duration in relation to the expected results, financial accountability methods, and arrangements for repayment.

In many irrigation projects, farmers are not charged for their water or are charged only a fraction of its cost. Such projects may not show a recovery of costs unless the total economy is considered as the base for analysis. Some features of the total economy that should be considered may include the project's effect on a dependable food supply, markets for crop surpluses, political stability, and work opportunities for unemployed labor. The value of such features are commonly determined by government officials.

Managerial feasibility should include an analysis of staff capability to complete the job, a training program to upgrade staff skills, and a plan for staff incentives. This analysis should also consider the availability of persons and an organizational network to transfer responsibility in promoting the project's objectives after it is finished. Managerial feasibility is also covered in the "Personnel" section of the proposal.

Political feasibility should be assessed by determining if the proposed organizations and changes are acceptable to the existing government and powerful opposition parties. Also, investigation of those who will be affected by the various solutions under the Development of Solution phase will provide insight regarding local and regional political feasibility.

Organizational feasibility is the likelihood that the organizations chosen to do the project will succeed. The feasibility analysis should estimate the ability of the organization to operate under different pressures. It should examine the possibilities for support from other organizations. Finally, it should determine the probability that the proposed organizational network will support the project's aims after the funding ceases.

Social feasibility is whether the project is acceptable considering important social values, practices, and community power structures. For instance, projects that contain elements contrary to local traditions

will be difficult to implement. Similarly, if community leaders are uninvolved, the project may not receive the support required to make it a success. Specific strategies must be designed to overcome these difficulties. It is also important to identify what social groups will be affected by the project, how they will be affected, and their reaction. It is also important to determine if the project will provide opportunities in the social structure for those who are powerless, or if it will strengthen the elite, or have no effect at all.

Feasibility information helps define what can be accomplished and often indicates how it should be done. Doing feasibility analyses before the project begins aids in project design and helps avoid major resistances and revisions.

The "Procedure" section should also contain the general work plan and schedule of the project. The work plan includes the activities needed to accomplish the objectives. Proposal writers may find it useful to define the required tasks with respect to time and to schedule them using the Critical Path Method (CPM), and/or the Program Evaluation and Review Technique (PERT). A discussion of these methods can be obtained from Joseph J. Moder's and Cecil R. Phillips', Project management with CPM and PERT, and Kenneth F. Smith's, Project evaluation and review technique, critical path method, line of balance: Project management Systems for economic development.

### Evaluation

The project evaluation section of the proposal should describe two main procedures. First, it should outline the method of final evaluation of the project which is based on the degree to which the objectives are accomplished. The second aspect of evaluation monitors the progress toward the objectives during the project. Measures of the accomplishments of the project according to its work plan must be established. These measures help the project manager and the staff determine whether they are on schedule in accomplishing their objectives.

The use of data from good monitoring and evaluation procedures allows continual refinement of a project as it progresses. Additionally, the evaluations demonstrate accountability of the project staff to the sponsors and clients. Some of the evaluation can be done by the project staff. However, evaluations by persons outside of the project

are essential to provide objectivity and credibility. Moreover, project personnel often become so involved in implementation they do not consider approaches that other persons may suggest.

Client-farmers should also be asked to help in designing the evaluations and gathering the information. If they are involved, they will feel greater responsibility for the project and will be more likely to learn how to determine when the system is operating effectively after the project is finished.

The general evaluation plan should be described in the proposal. It is important to collect baseline data before the project starts so comparisons of the results can be made after the project is completed. Too many final evaluation reports refer only to conditions after a project is finished, with no basis for determining what change actually occurred.

Another means of evaluating project impacts is by comparing project areas with adjacent areas where the project was not implemented. In doing this, the proposal writers should be aware that a) farmers involved in projects are often more motivated individuals, and b) demonstration effects of the project can cause changes in adjacent areas as well. Consequently, such comparisons can be biased.

Evaluations are expensive and they can have political effects. Sponsoring bureaucrats and politicians may not desire specific evidence to document the results since it could be used against them by their opponents if anticipated results are not achieved. In spite of these disadvantages for documenting failure, evaluations are essential in political systems that ascribe to the principle of accountability in government. To ensure that evaluations are not overlooked, a firm schedule should be established and responsibilities and funds for their conduct should be specified in the proposal. The potential political issue can be minimized if the expected achievements are estimated accurately and the proposal writers resist the temptation to increase the probability of funding by overestimating results.

#### Dissemination

Dissemination requires a plan to show how the effects of the project will be communicated from the direct participants to others who can benefit. The plan should designate which groups of people are

**expected** to benefit from the project and those who will not. Any groups who will be negatively affected should also be delineated.

Dissemination can be facilitated by the client-farmers if they are involved in all stages of the project. If they helped design the project and are supportive they will be helpful in disseminating the approach to other farmers and in maintaining the improvements of their project after completion.

The audience of the dissemination should be specified, as well as what will be diffused including knowledge, techniques, new equipment, attitudes, and new organizational forms. Dissemination methods should be described, whether its field demonstrations, testimonials, field days, pamphlets, model farms, or radio. It should be determined if dissemination will be based on demonstrating the effect in small areas, followed by methods to extend the results to larger populations. Possibly, a large-scale change will be attempted at once through massive educational programs, mandates, laws, decrees, or a combination of these.

An important aspect of dissemination is the institutions and persons through which changes will be spread. It is helpful when the plan involves influential individuals in the community and existing community or farmer organizations. It should also be considered if there is a plan for starting new organizations or revitalizing old ones. The USAID's interest in institution-building during the early 1970's was mainly generated to develop social, political, economic, and legal organizations to provide for continuing technical changes after projects were finished.

Another dissemination issue is that of developing persons capable of continuing the program after the technical experts on the staff leave. A sufficient number of interested and capable people should be trained during the project to assume responsibility for its continuation. It is important that project leaders be responsible for training the personnel so competent individuals can be prepared for their future roles. Often, technical people will be trained as extension workers, irrigation engineers, soils scientists, rural sociologists, and managers so that they can assume these functions when the project is transferred to normal or routine administration. Many projects include foreign travel and other educational benefits to motivate personnel and ensure there will be skilled people to staff organizations that evolve from the

project. Most water management development projects require permanent extension specialists to work with irrigation associations in helping the farmers improve their water management and agronomic practices in order to increase crop production. It is also important that extension and research trainees have close association since developmental and dissemination activities must be coordinated following project termination.

The plan may involve a strong initial but gradually decreasing reliance on the experts who provide support and consulting expertise during the early phases of the project. As the regular project personnel become experienced and proficient, their dependence on others should decrease.

#### Facilities and Equipment

The facilities and equipment part of the proposal should be determined by the tasks to be accomplished and the conditions of the work. A plan may be required for developing capabilities of local manufacturers to provide essential items at low costs. The basic information for such a plan should be available from the Development of Solutions phase.

#### Personnel and Training

The personnel section should be based on an analysis of the proposed work tasks. Proposal formats of some agencies require that project leaders and their qualifications be specified as part of the evaluation of the proposal. When this is required, some recruiting has to be done before the proposal is submitted. Qualified persons selected must understand the project and the specific jobs, accept the objectives, and be committed to the work.

Besides the specific persons named in the proposal, a tentative organizational arrangement and the persons required to staff this proposed organization should be presented. Availability of essential leaders should also be part of the feasibility analyses.

### Budget

The budget section of the proposal should follow the description of the staff, facilities and equipment, and an analysis of the required tasks. There are many categories of costs, but major areas to consider are salaries, wages, and fringe benefits; capital equipment; buildings; land purchases; materials and supplies; local and foreign travel costs; services including computer, laboratory fees, cleaning, repairing, road-building, and ditch-digging; consultants; training costs; communications costs; and miscellaneous. Each project will have specific requirements that may include items in addition to these listed.

The budget should be realistic and reasonable and based on experience in accruing costs for each task. If the writers do not have experience in estimating costs of certain tasks, they should obtain assistance from persons with that experience. A function of the Development of Solutions phase should be to obtain data on costs of each major task.

### OBTAINING PROJECT AUTHORIZATION AND MAKING LEGAL ARRANGEMENTS

It is likely the proposal will be revised several times before potential sponsors, proposal writers, farmers, and others interested are satisfied. Revising the proposal requires negotiations among all interest groups involved. Persons representing the technical proposal writers should be acquainted with research data collected in the Problem Identification and Development of Solutions phases so the procedures, costs, and expectations of the proposal will be within acceptable limits. Other persons who should be involved include representatives of the sponsor and those knowledgeable of the proposal submission and approval process of the government, and someone who can advise on the legal aspects of the project if laws or regulations need to be changed or established.

The negotiators will devise a legal framework detailing the rights, duties, and responsibilities of the farmers. In some cases a prerequisite for participation may be that farmers utilize an existing organization or form new representative entities such as irrigation associations. These associations, with officers who represent the

farmers, facilitate negotiations between the project staff and the farmers. Moreover, if the officers typically lead the farmers, they are most likely to achieve cooperation.

If farmers are not willing to accept the project conditions and requirements, the project probably should not be initiated because the lack of cooperation will lead to project failure. Consequently, the legal framework, conditions, and requirements should be discussed with and approved by representative farmers to determine acceptability. A cross section of the farmers living within the project boundaries must be represented. Owners of larger farms naturally assume positions of leadership, but the emphasis for work with owners of small farms dictates the need for their inputs. Agreement prior to implementation must be reached on matters such as what provisions will be made by farmers and the government, what land will be used, who will maintain the physical improvements and how often, and many other aspects of water management that are essential for a successful program. If even one important farmer is not consulted before negotiations, and later complains about what is being done, the project may risk failure. A written agreement with copies for both the farmers' and project representatives helps each group to understand and remember their responsibilities. Even in countries where the literacy rate is low there is usually at least one person in the village who can read and interpret the agreement for all the farmers. A photograph taken at the time of agreement is an effective reminder of the event.

Information clearly describing the project should be developed and a major commitment of time, energy, money, and personal interaction must be planned to educate the farmers about its benefits and costs. When large numbers of farmers are involved in a cooperative program, undoubtedly there will be a few dissidents who will refuse to initially cooperate. Since it would be unfair to the majority of farmers to prevent them from participation because a few were negative, procedures for allowing the majority to proceed with a project, and a description of the means of charging noncooperators for the costs of their portion of the benefits should be drafted. In some projects, all the farmers are informed and then asked to sign a statement indicating their understanding of the project and obligations to the project before

the final proposal negotiations occur. In other projects, farmers themselves have gained compliance from dissenters; consequently, farmers should be allowed to help enlist farmer support.

Several aspects involving relations between government organizations need clarification when planning a project. A potentially good project may fail because of inadequate legal arrangements between the government organization and its supporting organizations. Problems may arise in which there is no general solution and the project leaders may be prevented from acting effectively. It is necessary that the project designers anticipate political misunderstandings and disagreements that could lead to the withdrawal of resources, and that plans be made to handle potential disruptions. Leaders of agencies that give authority to the project may be reluctant to make commitments to projects because they want to keep their options open. Project leaders, however, need a clear assignment of authority and the right to enter into agreements so they can plan and act without concern for arbitrary actions from other organizations.

Some of the legal arrangements between organizations should be outlined in the proposal. Areas that should be considered in writing the contracts are:

1. Scope and line of authority,
2. Legal and operational objectives of the project,
3. Duration of project operation,
4. Types of reporting instruments and schedule of use,
5. Personnel requirements,
6. Flexibility in assigning pay and tasks,
7. Project and other agency requirements on cooperation and jurisdiction of subject matter and geography,
8. Budget constraints,
9. Accountability requirements by category,
10. Enforcement provisions for accomplishing objectives, and
11. Legal authority and processes for managing personal behavior and conflicts concerning water, land, credit, and local institutions.

Each project will have to direct the issues differently, but the items listed above are common concerns for on-farm water development projects.

Formalizing the project manager's authority to act in relation to the organizations that sponsor the project is another legal issue. Managers need formal and enforceable arrangements that allow them to control recruiting, selecting, training, evaluating, and dismissing of personnel; evaluating the project; disbursing money; purchasing; and changing the project's focus. The project manager's relationship to officials of agencies linked to the project should be carefully defined.

Special questions arise if the project has a research component. The project manager must be given authority to collect valid and reliable data, to specify the equipment and procedures used in data collection, to prohibit dissemination of incomplete or inaccurate information resulting from interpretation of the data, to secure publication rights, and to specify rules governing authorship of reports resulting from the project.

Although relationships based on trust and credibility can be as effective as legal ones, it is necessary for project designers to secure legal and administrative understandings and commitments for the project managers. The managers and project staff should attempt to develop trust and cooperation with farmers and interested organizations, both before and after they have established a legal basis for their project activities.

## CHAPTER II

### ESTABLISHING THE PROJECT ORGANIZATION

Once the project is authorized by the government (and donors, if other assistance is involved) implementation can begin (Figure 3). New people, personnel procedures, and specific tasks must be organized and introduced into the work schedule. The focus becomes directed toward developing strong project organization. Contacts with organizations that provide various support to the project need to be secured and maintained. Project personnel must pursue the objectives aggressively; follow good management practices; remain open and responsive to changes, inevitable conflicts, and requirements within its own organization, other agencies, and within the farming community; and organize and train local people so they can maintain improvements after project personnel have left. The objectives of the project must be refined and made the responsibility of the units and persons within the project. Progress toward the objectives must be continually monitored, and the project's direction should be frequently evaluated with respect to progress and changing conditions. Those responsible for implementation must collaborate with farmers and other persons influenced by the project. Efforts must be made to build understanding, credibility, and commitments in farmers and other participants so the project's objectives will continue after its conclusion. In addition, the project must develop an organization for personnel who will continue the long-range work established by the project.

### DESIGNING THE ORGANIZATION

The general design for the organization was probably outlined in the proposal. However, many specifics cannot be ascertained until after project authorization when available personnel can be determined. The organization should be designed to achieve the project objectives as efficiently as possible.

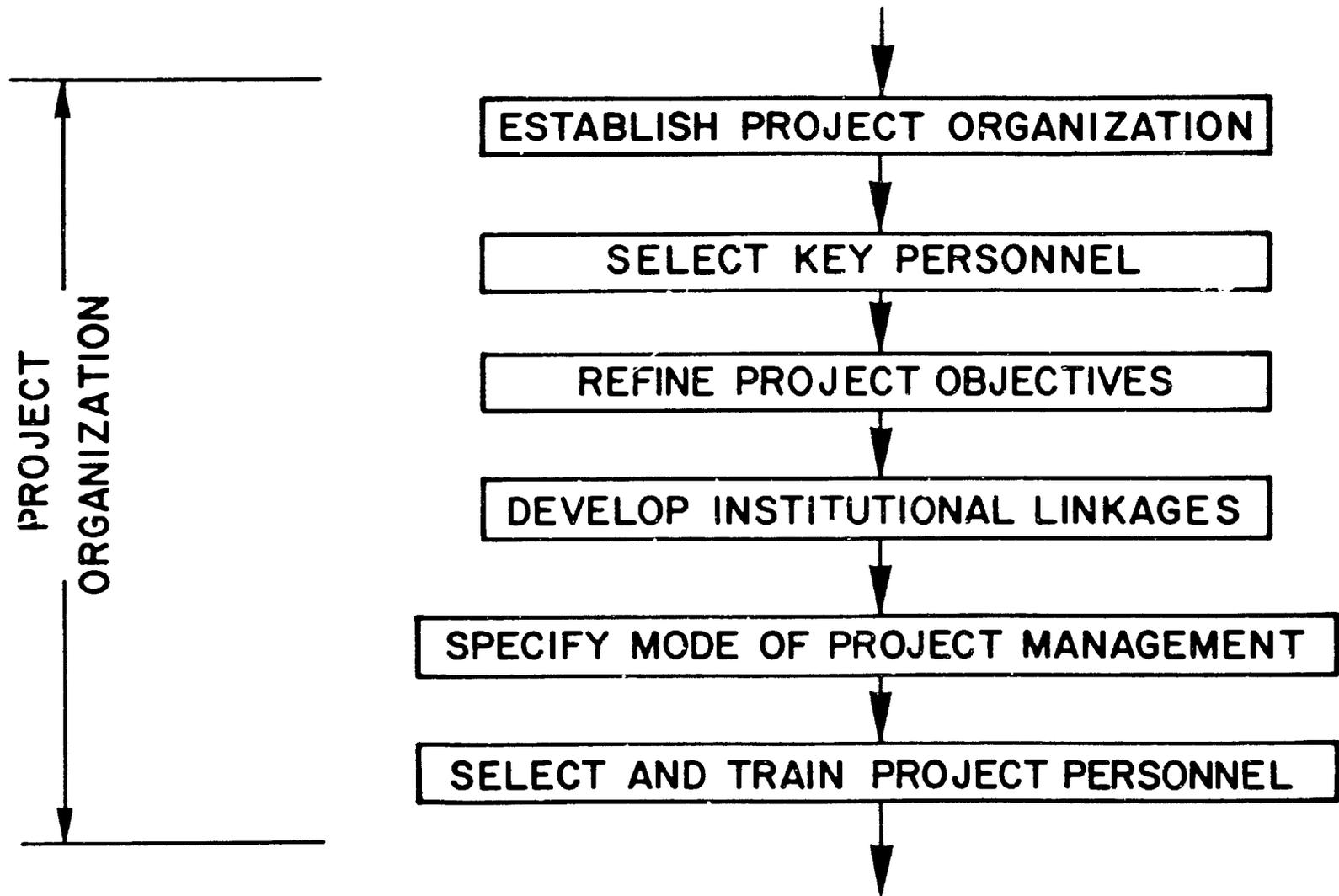


Figure 3. Flow diagram of activities in the Project Organization subphase.

### Differences Between The Project Organization and Other Organizations

Some differences between a project organization and a bureaucratic organization should be considered. In project organizations there is typically less formality between the leader and the rest of the staff. This results because of greater interdependence of project staff members who are oriented toward common, new objectives. On-farm water development projects are usually interdisciplinary, involving agronomists, soil scientists, agricultural engineers, agricultural economists, rural sociologists, extension specialists, anthropologists, management specialists, and others. To ensure all of these people will work well together requires effective communication and careful coordination of several disciplines. Informal communications channels are encouraged, as is creativity and unstructured forms of problem solving. Project organizations have an indefinite division of labor as compared to bureaucratic agencies that require specialized skills for small tasks. Projects have needs for technical experts, but project staff ordinarily accept general responsibilities as well. Project efforts usually result in a unique solution to a problem which differs from other organizations that consistently produce the same type of result. Projects are temporarily established to accomplish objectives in a specified time as compared to the permanent nature of other organizations. Projects deal with change and encourage evolution until improvement is achieved while other agencies promote stabilization.

Loyalty for a project may be a problem, since staff are often on loan from other organizations. Besides being committed to the project, the staff may be concerned about their status in their regular agency. In addition, sometimes the project's objectives conflict with the goals of their own agency.

In a project organization, personnel must adopt a broad systems approach in viewing the project and the environment, whereas, personnel in organizations that do not consider change can perceive themselves as more self-sufficient. In order to maintain a broad outlook, project staffs are required to:

1. Have knowledge of the forces affecting the project,
2. Establish the project as interdisciplinary,

3. Be aware of the political, social, and economic atmosphere, as well as public opinion,
4. Perceive their internal condition effectively since project success is based on cooperation, and
5. Continually revise plans as a result of being a new undertaking.

With these points considered, project leaders must choose an organizational design. Four framework models are usually considered

1. Temporary staff within an agency,
2. Staff from one agency, but who go from one project to another,
3. Staff consisting of people from several agencies, and
4. Staff composed of people contracted to do the project, but who are not necessarily from governmental agencies.

#### Temporary Staff Within an Agency

One possibility for a project's organizational design is for the project to function within a government agency. Project staff can consist of agency personnel responsible for the project as well as continuing to perform some of their regular functions. Project staff would work on the project until completion and then return to their regular jobs in the agency. There are several advantages to this approach.

1. Long-term national and agency goals may be incorporated into the project's work.
2. The existing organization is available to provide support to the project.
3. Resources available within the agency are relatively easy to obtain.
4. The staff may enhance their careers in the agency if they do well on the project.
5. Job security for the staff should be high compared to most other project organizational designs.
6. There is less likelihood of conflict among the staff because of similar value orientations by being employed in the same agency.

7. Terminating the activities of the project staff is easier under this model.
8. Project objectives can continue as part of the agency's goals once the project terminates.

However, there are disadvantages of having the project as part of an agency. Changes required of farmers are likely to appear as imposed from the government, especially if this was the agency's previous method of operation. Unless a new approach to solicit farmers' input is utilized, then farmers may be less willing to commit themselves to a project using this design.

Formal organizations such as the Agriculture and Irrigation departments have often established strong, traditional controls that make them inflexible and resistant to change. Because of this, these organizations may be ineffective for implementing innovations. The purpose of many existing agencies is mainly regulatory, therefore, they are not easily adapted to programs relying on farmer involvement. Project leaders should be cautious of working through an existing agency not geared to the modernization of agriculture. Conversely, serious consideration might be given to using the project to mobilize the agency to effectively participate in national development.

Another disadvantage of this framework and the following one is the agency's managers may be reluctant to put their best people on the project. Instead, they may use the project as a place to relocate ineffective workers. Administrators of the agency can prevent this problem by demonstrating strong support for the project. Persons coordinating the project staff can ask to see performance appraisals on the people assigned to the project to ensure a good staff is assembled.

Agencies typically have good communications within a specific area but are poor at coordinating several areas or disciplines; a requirement in most on-farm water management development projects. In addition, there is a danger project work will become secondary to the daily demands of the agency, and hence the project's task might not be accomplished.

### Permanent Staff within an Agency

Another model is to have project staff be a part of an agency with their main responsibility to conduct on-farm water development projects on a permanent basis. This arrangement is appropriate if the government has determined that water management provides a continuing opportunity for improvement.

Most of the advantages listed for the design using temporary staff within an agency are true for this approach as well. Additionally, permanent project staffs within an agency should be more flexible because they constantly deal with new programs which necessitate developing skills for coping with change. Coordination among various disciplines should be better in this model because the staff would be working together on a long-term basis. However, project work should not become secondary to other agency work since project work would be the reason for the staff's permanent existence.

Besides some of the disadvantages cited for having a project staff within an agency, one disadvantage of this approach may be that staff will be treated differently from other personnel in the agency. Because they work on change, the staff may feel pressure from other agency persons whose functions conflict with project activities. In addition, the staff may be pressured to work on agency priorities not related to the project at the expense of the farmers.

### Staff from Several Agencies or the "Matrix" Design

Another framework, similar to those just discussed, is the "matrix" design. Rather than forming staff from within one agency, this model utilizes people from several agencies. Selection of personnel is based on technical expertise and the need for representatives from various agencies. Advantages of the model include representation of interested agencies and coordination of their interests within the staff which makes this a good model for "institution building," or developing better cooperation among existing organizations. Additionally, the project is likely to get more proficient staff members from the increased number of potential recruits than if the staff is assembled from one agency. The broader range of personnel backgrounds and disciplines brings more knowledge for successful implementation of the solution.

This design, used in formal organizations that must cope with frequent change, can utilize existing organizations to help solve problems. Several researchers have suggested these temporary organizations within formal organizations will be a major project design of the future. Organizations that use "management by objectives" move toward the matrix model with temporary project staff assembled to accomplish goals. This approach effectively bypasses the slow, uncoordinated approach of problem solving that frequently exists in formal bureaucratic organizations. Disadvantages of the matrix design are explained below.

1. Unresolved conflicts between agencies such as the Agriculture and Irrigation departments may inhibit project effectiveness.
2. The question of which agency will supply the leadership for the project is frequently an issue.
3. Authority is not clear on some matrix projects because it comes from several agencies.
4. Coordination of the project activities between the different agencies may require that agency officials periodically review the project.
5. Project leaders have to be skilled in integrating staff and using participative management techniques.
6. Decisions tend to be made by committee rather than through strong leadership which can be a problem.

#### Staff as Contract Personnel

The last model enlists staff as contract employees. It is possible to use both contract and agency employees, however, generally the approach is to contract with a consulting firm, university, or a group of people assembled especially for the project. This framework is used when the appropriate agencies do not have persons to do the project or prefer to use outside staff.

An advantage of using contract personnel is that persons with previous experience in similar projects can be selected to do the job. Consequently, mistakes that result from doing a project for the first time can be avoided because technical experts and skilled managers do the work. This model may allow the most change to occur because

outside persons may be more willing to be creative and assume greater risk in attempting new approaches than agency staff. Risk avoidance by agency staff is strong where their promotions are based on seniority and having made few mistakes rather than on the basis of accomplishment. Contract staff may have more credibility as consultants for change because they are from other work environments and are perceived as professionals interested in doing a good job rather than advancing themselves or an agency within the social, political, and economic systems encompassing the project. Donors often prefer this model because they want to relieve the project from the constraints that go with undertaking activities within the confines of a bureaucratic agency. An on-farm background is helpful since the ability of staff members to train farm people is necessary if project impact is to be long-term. Time spent collaborating with the farmers and other influential persons should be viewed as a productive investment.

Using contract personnel has disadvantages, however. Creative approaches utilizing contract personnel often achieve the best results but they can also fail because of many reasons.

1. Competent staff may be expensive and hard to obtain because they have other commitments.
2. Contract personnel can be too self-confident and independent rather than contribute to a group effort.
3. Management under these conditions requires additional skill.
4. There is increased demand for group cooperation, attaining conflict resolution skills, establishing good communication and accountability practices, and using participative methods of management.
5. Staff are required to have an understanding of cross-cultural differences and an ability to work with persons of different backgrounds.
6. Because the staff may be from other geographic areas, they spend more time developing relationships with the farmers and other interested persons and organizations.
7. Terminating project staff activities is more of a problem with this approach because for some staff members termination may lead to unemployment, which is likely to divert the attention of personnel from the project to their next job towards the end of the project.

8. Project management must be alert to personal issues surrounding termination and should plan to help staff members cope with them early.
9. While the project staff may be more effective in producing change, they have less ability to establish mechanisms for ensuring that the project objectives endure after project termination.
10. Considerable time must be spent convincing administrators that project objectives should be incorporated in continuing agencies and cooperating organizations.

The choice of an organizational model must depend on political, social, economic, and other conditions influencing the project. Additionally, the project requirements and the agency's organization should be considered when selecting a preferred approach. The models described give the project organizers flexibility to account for a variety of situations.

#### PROJECT ROLES: SELECTION OF PRIMARY PERSONNEL

From project conception until completion will involve many people. It is often difficult to identify the initiators of the project because ideas for the project may have evolved from several sources. The first definable roles, according to the processes described in these manuals, are those of the technical people and farmers who participate in the Problem Identification and Development of Solutions phases. Some of these people may be included in writing the proposal and even into implementation, while others will not.

As funding becomes probable, proposal writers and responsible government officials must identify potential candidates for major positions in the project and determine their ability and willingness to serve. Depending on the organizational design chosen, the first roles to be defined are those of the project director and other leaders. Figure 4 shows one possible organization arrangement. The project director may be referred to as a manager or other title and has the responsibility of coordinating and directing the project.

Persons in these roles should possess several attributes to be effective. Based on a study of project leaders, the USAID publication, Selecting Effective Leaders of Technical Assistance Teams, Technical



Assistance Guidance Series-2 (1973), suggests the qualifications listed in Table 3. Project managers or leaders should also be able to achieve the respect of the project staff, donors, and officials in other organizations associated with the project. It is unlikely, however, if any individual will possess all of these attributes.

Those selecting personnel must describe the attributes needed for each job, such as those listed in Table 3, then seek people who best fit the requirements. Attributes should be assessed according to their importance on the project, and candidates should be disqualified if they do not possess the essential characteristics.

Measures of these characteristics can be obtained from interviews with the candidates or recommendations from previous employers. Objective testing may be helpful to measure technical competency, and biographical rating forms will help determine the level of experience as described by the candidate. It is possible to construct assessment centers to simulate job activities and to rate the candidates on the required attributes, but this procedure is expensive and requires consulting assistance.

One of the most important qualifications of the project manager is to be knowledgeable and enthusiastic about the project. Persons who have participated in the Problem Identification and Development of Solutions phases should be considered for the project manager position.

If contract personnel are used for the organizational design, recruitment should cover a broad geographic area to ensure that the best qualified candidates are considered. Often, people who select project leaders choose persons who are friends or are well known to them and miss other good candidates.

Some other positions that should be filled soon after funding are the high level support staff (deputy manager) roles. These are people who will not be members of the field staff, but who will supplement the skills of the project leader and major technical people. They can come from the donors, government agencies, universities, or consulting firms. These senior persons primarily serve the project from a location away from the project site although they may travel to the site occasionally. They ensure continuance of the funding; work with donors, high government officials, and other organizations that affect the project; and offer special assistance to the project.

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Table 3. Qualifications for effective project leaders.

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1. Appropriate technical background (in this case, in water management, agricultural development, or a similar field).
2. Experience in applying their expertise in geographic areas such as that of the project.
3. Ability to initiate and strengthen organizations that will use the project's improvements after the contract is completed.
4. Credentials such as degrees and experience that establish credibility with government officials.
5. Ability to manage administrative detail.
6. Capacity to anticipate alternatives for the project depending on future events.
7. Ability to use personnel effectively.
8. Experience working with government agencies.
9. Empathy or the ability to understand how others feel.
10. Good treatment of previous colleagues.
11. Courteousness.
12. High energy level with a reputation as a hard worker.
13. Motivation to attain the project's objectives.
14. High initiative.
15. Willingness to accept constraints of the project.
16. Ability to work within established policies.
17. Skill at recognizing local methods of doing things and conforming to them.

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**Table 3. Qualifications for effective project leaders (continued).**

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18. Ability to develop commitment in other people.
  19. Emotional maturity.
  20. Sound character and high personal integrity.
  21. Good standards of personal conduct.
  22. Documentation of success on previous projects.
  23. Open-mindedness and objectivity.
  24. Willingness to admit mistakes.
  25. Does not require undue recognition of own status.
  26. Ability to resist extreme measures in a crisis.
  27. Capacity to make constructive responses to mishaps.
  28. Ability to persevere during reverses.
  29. Strength to stand by personal values under stress.
  30. Willingness to accept responsibility for making difficult decisions regarding personnel or other managerial actions.
  31. Willingness to take appropriate risks.
  32. Capability to develop supporters from other organizations.
  33. Perceptiveness in sensing tensions likely to affect the project.
  34. A history of good interpersonal relations.

Characteristics of good senior staff specialists include technical competence and experience, political contacts, and good relationships with donors. These specialists are more likely than field staff to be involved in a variety of professional activities and have access to good libraries and computers. They can supply the project leader and field technical staff with current readings on technical questions and obtain project assistance from numerous sources. Persons who did research leading to the proposal and the proposal writers themselves are good candidates for these roles.

Other persons who will probably be selected early in the project are the primary technical field staff specialists serving under the field project leaders. Most likely they will be needed in disciplines such as agronomy, agricultural engineering, economics, extension, management, and social science. Those selected have to be technically competent but it is important they have other skills and interests. The field specialists should be able to understand the theories and principles governing the project and use advanced methods in their technical area. They should be able to recognize technical problems as they occur. Equally important is an ability to work with staff and farmers of different statuses, disciplines, and cultures in difficult situations. They should be good teachers and willing to train others who will eventually have responsibility for accomplishing project objectives and developing new ones. They should be interested to learn about other disciplines and approaches so the project can benefit from their expanded knowledge. They should also accept some of the responsibilities for managing the field staff, which is discussed later. Experience and competence in helping farmers apply the solution to the problems are important qualifications. Unfortunately, excellent technical persons may not be good group members because of excessive zeal for their own discipline, a lack of field experience, and exceptionally high standards of work that are only possible in a laboratory or under controlled conditions.

Personnel who participated in the Development of Solutions phase should be considered for implementation staff positions due to their experience with the project. These people should also be used in training programs where they can convey their knowledge of working with farmers to less experienced staff members.

Most of the other selections of the project's field staff should be done with the advice of the field project leader after one is chosen. The remaining positions consist of the administrative people and the lower level technical and contract persons who do the physical work involved in the project. This is discussed further in Chapter III.

When staff members for all the positions are selected, it is worthwhile to thoroughly discuss their obligations. It is important their responsibilities be clearly outlined in a job description. It is difficult to write descriptions for project staff positions because the division of labor is not distinct, and project staff are expected to do work necessary to accomplish a variety of singular tasks, whether or not the work was outlined in the job description.

Besides formal negotiations about pay and job requirements, the project manager should explain the expectations for what should happen on the project to headquarters staff and field project leaders. In turn, this would be done by the field project leaders for their staff. The staff should state their expectations as a result of working on the project, the kinds of gratifications they expect from their job, and their career expectations at the end of the project. The manager and project leader should discuss possible advancements and expected rewards in addition to the nature of the work. The project manager and field leaders should ensure that an honest discussion is held. Hopefully, both the staff person and the leaders will agree on expectations, goals, and plans for the individual's involvement as related to project objectives.

## CHAPTER III

### DUTIES OF THE MANAGER AND FIELD LEADERS

Functions of the project manager include setting objectives, formulating schedules, organizing operations, selecting personnel, directing staff, measuring progress, and reporting status. Devising a budget may also be included in the list. It has been mentioned previously that the general budget will be prepared when the proposal is written although the leader must refine it once project objectives are finally established. This chapter will explain the functions of the project manager and project field leaders as they are involved in on-farm water management development projects.

After the leader (project manager) is selected to implement the project, roles of other persons who have already participated in the project may change. The project manager may have authority to select project personnel, however, this will usually be done in cooperation with government administrators, particularly when the staff comes from government agencies.

The project manager is responsible for accomplishing the objectives stated in the proposal. One of the first things to be done is refining the work plan and schedule. Most of these tasks can be completed with assistance of those who participated in the Development of Solutions and Problem Identification phases, and with the implementation staff that has already been chosen. This group should select the rest of the implementation staff after determining their tentative job descriptions.

When the implementation staff is complete, the project manager should orient them to the procedures and style in which the project will be managed. Important staff roles, project goals, communication patterns, methods of feedback, and means of resolving conflicts should be discussed.\* The project should be described in terms of the social,

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\*The project leadership should be aware of several factors that inhibit implementation of a project that occur within the bureaucracy of the agency and project staff. These factors, as identified by Robert Chambers in Managing rural development, are authoritarian management, wasteful meetings, excessive reports, departmentalism, top-down targetry, inadequate resources, and ineffective work programming.

political, technical, cultural, and economic forces that must be recognized and considered by the staff. If the project affects persons of more than one culture, issues of cross-cultural differences must be highlighted.

The leadership must design control systems or a means of ensuring the accountability of the project and the staff. Control can be obtained from monitoring the project's and individuals' progress toward the objectives and comparing it with the work schedule. Methods of recording and approving project results must be designed.

The staff will be involved in training sessions as participants and teachers. They must be trained about the procedures and control systems used on the project as well as how to facilitate and encourage teamwork. Conversely, staff must instruct farmers and those selected to provide local leadership. Additionally, staff may need preparation to help them become effective teachers.

As implementation proceeds, the staff should anticipate resistances from external persons or groups that might hinder progress. Such individuals and groups should be contacted quickly to determine and alleviate the basis of their opposition.

Project leaders should develop mechanisms for supporting the staff to insure project success. The mechanisms should provide a means of relieving job-related stresses for individuals. Other supports should provide resources and assistance when the project needs additional strengthening.

The final responsibilities of the leaders are to evaluate the project's effectiveness, report the results, and release the project to the farmers or their associations and those trained to provide assistance.

## REFINEMENT OF OBJECTIVES, PLANNING, AND SCHEDULING

One of the first tasks of a new project manager is to refine the general objectives, as originally defined by the proposal writers, into components that can be scheduled for completion by the field staff. For example, an objective to "increase the wheat production in a specific geographic area by 15 percent by 1993" could be conceived as a series of activities that should lead to accomplishing the objective.

Included may be tasks on land leveling, water-course realignment and rehabilitation, achieving a more equitable scheduling of water to all the farmers in the area, use of more reliable and improved varieties of seed, application of recommended fertilizers at specified rates, development of a market distribution system to accommodate the increased crop production, enhancement or formation of irrigation associations, and enactment of water laws or regulations. In other words, the general project objectives must be operationally described as specific end-points that can be reached by completing several activities. The completion of each activity is expected to lead to the accomplishment of the operational objective.

The project manager, project field leaders, and technical field staff should list the activities essential to reach the objectives and their estimated time requirements. Some of the management techniques such as the Project Evaluation and Review Technique (PERT) and the Critical Path Method (CPM), referred to in Chapter I, help assure the work directly relates to the objectives.

A PERT analysis begins with listing each project task and the estimated time it will require (Table 4). The first listing should consist of the major jobs. Refined listings can be developed later by reducing the major jobs into specific tasks. Each task and time estimate can be displayed in a PERT network as shown in Figure 5. To design the network adequately requires management decisions about the relationships and sequences of the activities.

The project manager should consider the principles of participatory decision-making discussed later in this chapter since few managers could design a network to everyone's satisfaction. The PERT diagramming requires the involvement of the staff and even the farmers who are experienced in various phases of the proposed activity to determine how the tasks can be most effectively distributed. The staff's conclusions about the proper sequence of activities and those that can be attempted concurrently are incorporated into the diagram.

All the tasks in Table 4 are depicted by their number in Figure 5 and are sequentially placed by arrows. If an activity cannot be started until another is completed, this relationship must be displayed on the

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**Table 4. Example of simplified Project Implementation activities.**


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Task number	Task description	Estimated Time (weeks)
1	Project authorization	0
2	Get signatures on all agreements (including time of budget releases)	2
3	Select project personnel	3
4	Start and complete personnel training	4
5	Final selection of site(s)	2
6	Design project monitoring and evaluation system	3
7	Establish management and budgeting system	2
8	Devise data management system	1
9	Submit first progress report	2
10	Develop communications with farmer clients at sites(s)	4

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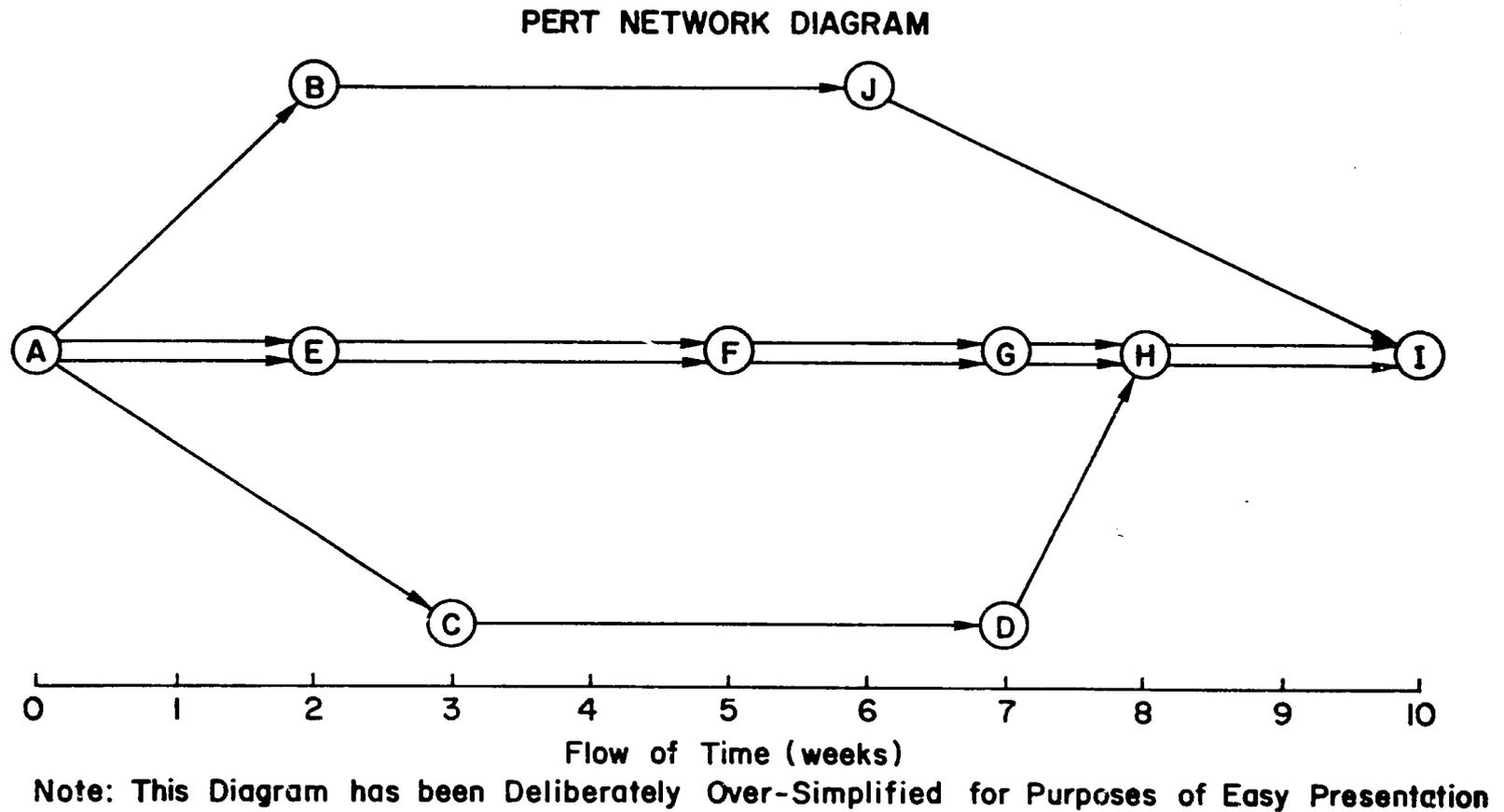


Figure 5. Example of PERT network diagram for some simplified Project Implementation activities.

diagram. Chains that can be performed concurrently are above and below each other through the time period covered by the diagram. The diagram is a set of task chains which are a model of project operations. The first version of the network diagram will only include the major tasks; however, a more refined network can be developed later by detailing the major activities.

After each task is charted, the longest series of tasks is identified by double arrows. This series is called the "critical path" because it is the longest in time and any revision to shorten it will hasten project implementation. The project leader will want to determine how individual tasks can be changed or rearranged in order to shorten the time in the critical paths. Spending resources to solve a problem that threatens to slow an activity on the critical path may be justified. Conversely, if activities not on the critical path should be delayed, there is a minimum time before the delay will adversely effect project completion. It may be wasteful to spend extra resources trying to accelerate tasks not on the critical path although the paths may require adjustment as experience is gained. As previously mentioned, there are several good references on PERT and CPM that should be consulted by the project leader before using these methods.

Estimates of labor, skills, materials, and money should be made for each step in the diagram. If a step is extremely costly, the staff should consider alternative ways of accomplishing the task. From this process, a work plan can be developed to help the leaders determine the most efficient and effective ways to utilize personnel, money, and other resources. Completion dates, costs for each phase of the project, and the skill and labor requirements of the staff positions can be determined. This information can help decide who and when to recruit for the technical staff. When people are hired, they can be given individual goals that can be recognized as part of the project goals. The PERT method is a means for planning and evaluating individual and project performance.

The procedures necessary to attain the objectives form a work plan that should be periodically reviewed and modified by the entire staff. The plan may change as the project progresses because of new knowledge the project staff will gain.

## SELECTING THE SUPPORT STAFF

As previously stated, some positions on the field staff will likely be selected after the manager, primary technical people, and field project leaders have been chosen. Next to be appointed are the administrative staff such as the accounting, secretarial, data management personnel, and contract labor who may hold only temporary positions. All of these staff are important to a project's success and care should be taken in their selection.

Secretaries, accountants, and other administrative staff provide some control functions on a project. They control information, people, and money, and they can influence the operation of a project. The administrative staff should be selected for their appropriate skills that can be evaluated by a performance examination. For instance, a typist should be able to type with a certain speed with minimum errors. Potential administrative staff should describe their experiences; however, references should be obtained from former employers. The field project leader should ask the reference persons specific questions concerning skill, motivation, and work history rather than just general statements about the applicants' character.

The contract laborers do the driving, digging, and act as a liaison with local persons. When a project is announced, it can create a temporary boom in a region's economy that will attract many candidates for available positions. The field project leader must choose those who will most benefit the project, being aware that those who apply first are not necessarily the most qualified. They may have been unemployed due to inadequate work skills. In addition, the early applicants may have an advantage in the informal communication system that spreads news of the project. Perhaps they were informed of openings by other staff who want to get jobs for their friends and relatives, or they may be persons who can benefit personally by associating with the project but who would not necessarily do good work. These factors support advertising positions for a reasonable length of time before selections are made.

The project manager and field leaders should be concerned about who is hired and how it is accomplished, although some of this authority may be delegated to subordinates with proper experience and

commitment to project objectives. Objective job descriptions should be used for choosing personnel. The decision to hire should be based on ability and motivation, and the impact the selection will make on the rest of the staff. It is important that selection be fair, open, and objective, and potential workers impartially selected. An exception might be if certain segments of the community will be involved with the project then it may be important to establish good relations by hiring qualified candidates from among them. However, the workers should not come from one family or friendship unit. Available jobs will be regarded as a precious resource, and if distribution of jobs is fair, there will be less community resistance to the project as it progresses. When possible, performance tests should be used to evaluate candidates. If the required skills are so basic that a test is unnecessary, and if there are many applicants, then drawing a name by chance is a fair way to choose a worker.

#### ESTABLISHING PROJECT TEAMWORK

Once all of the staff are selected, the manager must establish the tone for the project's operation. Staff meetings should be held to organize personnel and motivate their cooperation. Project leaders may feel they are too busy or do not need to develop their staff because they selected good people, but this development is necessary.

The term teamwork implies a group of people who work well together and produce a better result than if the same people worked separately. Teamwork generates good feelings by the members about their work and the people with whom they work.

To develop teamwork the project leader must integrate individuals with different experiences and capabilities into an effective unit. Sometimes this is a challenge in on-farm water development projects because the work force is composed of persons from different disciplines and cultures. When a collaborative style is used and the farmers are included, facilitating teamwork requires skill and extra effort from the project leaders.

The project leaders should clarify to all personnel that inputs from all the disciplines are essential for success. Individuals from each discipline should be encouraged to interact with and learn from staff in

other disciplines. Understanding the objectives of the project will help the group comprehend the need for inputs from other disciplines. When the leaders do not unduly emphasize their own discipline and instead show respect for others, most staff will do likewise.

Common outcomes for projects utilizing several disciplines are that one discipline becomes dominant and a trend is established to use its methods; or several disciplines are utilized without coordination until the project is almost completed, and then a massive attempt is necessary to combine these efforts to achieve project goals. When one discipline dominates, the project is unidisciplinary; and when several disciplines are used but not together it is multidisciplinary.

Interdisciplinary means that various disciplines are integrated during the project duration. In interdisciplinary projects, staff from various disciplines try to learn each other's approaches, values, problems, and language. Vocabulary is often different for various disciplines and personnel from each area should try to learn the other disciplines' major concepts and terminology.

Meetings should be held to examine project objectives and decide how each discipline can contribute to their accomplishment. It is important that staff from each area discuss their concerns and potential contributions to each objective, even though some objectives are the primary responsibility of a single discipline. Coordination of efforts on good interdisciplinary projects must be done early and continuously with each area contributing to achieve the objectives. The strength of the personality of various discipline's members and the prestige connected to a specific approach should not be the main reason for deciding issues. The results of effective interdisciplinary work are completion of the project's goals, knowledge and respect for the contributions of other disciplines, and positive feelings between staff members.

Training to develop cooperation by the field team leaders will often be sufficient to induce teamwork. However, if interdisciplinary groups do not develop this approach, special training by consultants may be advisable.

Some approaches to management that encourage interdisciplinary teamwork are the use of participative management; good communication

practices, including constructive feedback; use of effective problem-solving and conflict resolution methods; and application of management-by-goals methods. These management approaches are described below. They do not happen spontaneously, and determined, well-planned efforts by the project leaders are necessary to make them functional.

### Participative Management

Participative management for the project staff is consistent with the collaborative style advocated for working with farmers. Participative management implies that all of the project staff will be allowed to provide input into the management of the project. Its use indicates that project leaders recognize there are persons on the staff whose input will be beneficial in making important project decisions. Project members usually respond to this compliment by having more respect for the leader. Other benefits of using the approach are listed below.

1. On complicated problems, groups possessing diverse expertise can typically devise better solutions than individuals.
2. When people participate in decision-making, they understand why and how decisions are made, and tend to be more supportive compared to when they are just told to do something.
3. Staff are more committed to help carry out the decision.
4. The technique uses the available human resources as well as any management approach.
5. Participation enhances people's feelings about themselves.
6. Resistance to implementing a decision can be reduced by asking those affected to contribute to that decision.

Even though there are many benefits to participative management, there are drawbacks. Many leaders and staff may not be used to this technique. It may confuse them and they may prefer a more familiar authoritative leadership style; consequently, they may be unwilling to try participation. Many work organizations and cultures of the world do not use participation as a common practice so it may be strange and

upsetting to some project members. Under some circumstances, a leader who tries the method may be viewed as weak for asking the staff for advice.

Another problem with participative management is that project members may prefer not to accept responsibility for decision-making. They may want the leader to tell them what to do so they can hold the leader responsible if something goes wrong. Some people think it is not their right nor job to help make decisions.

One other problem with participative management concerns the leaders' perceptions about their own power in an organization in using the approach. The leaders may feel they are yielding power and will not have authority to run the organization. If participative management is used, it is likely a stronger organization will result and the authority of the leader to encourage staff production will increase rather than decrease. It is a paradox that by sharing some authority it is possible for the leader to gain more authority.

The leader using participative management must be honest and skillful. Honesty is an issue since the leader must openly state when the approach will and will not be used. If project members notice that the leaders only use it when they want to motivate the members, the approach will fail. This does not mean that all decisions must be made participatively, and in fact, that would be impractical since the method takes more time as compared with more authoritative management. The project manager and field project leaders should make most routine decisions by themselves or by consulting others who can offer useful advice. Decisions about the direction of the project, major problems and issues should be dealt with participatively.

A challenge for leaders using this method is to effectively lead a group meeting. They must be able to solicit information from the staff, listen closely to their responses, and integrate their responses into decision-making. Some general steps used for conducting a participative decision-making meeting are listed.

1. When the leader decides a problem requires a group decision, some preparation should be accomplished before the meeting. The leader should clearly define the issue; decide what time, money, labor, or other constraints exist; think of a solution; and write questions to generate a discussion about the problem.

The leader may also ask participants to do these same things if there is time and the issue has been clarified previously.

2. At the meeting the leader should present the problem but not offer solutions until the participants have an opportunity to express their ideas.
3. The leader should help the participants understand the project constraints and ask for their assessment as well. Sometimes participants have information that will affect the definition of the constraints and change the possible solutions. The leader should solicit this information.
4. The leader should try to get as many ideas as possible about constraints, problems, and potential solutions, but should not allow premature criticisms until the items have been thoroughly discussed.
5. Everyone should express their ideas. No one should be allowed to remain silent during the entire meeting nor dominate the conversation. Some participative methods set time limits on the amount of participation for one person.
6. The leader should speak relatively little and encourage member reactions.
7. The leader should write down all the ideas on a blackboard or large pad of paper which is kept in view of the group.
8. When the members have no new ideas, the ideas of the leader should be added to the list and then all should be evaluated.
9. Criticisms of each idea should be recorded.

The next part of the meeting can vary depending on the leader's preferences. The leader must have decided how to use the recommendations of the staff beforehand, and have shared this decision with the participants at the beginning of the meeting. In some cases, the leader may take the participants' ideas and privately decide what should be done. Another option is to refer the ideas to an executive committee for decision or use the participant group to make a decision. All of these models are used and have advantages. Victor H. Vroom and Phillip W. Yetton's, Leadership and decision-making, presents a way of analyzing the issue being discussed and relating it to the kind of decision-making approach to use.

The leader should agree to a decision carefully, and if the group is allowed to decide they should try to achieve a consensus. A consensus is a general agreement reached by discussing the options. It may seem difficult to attain, but having group solidarity for a decision positively affects the commitment to act, and the additional time needed to reach a consensus is often worthwhile.

In general, participative management is a good approach on interdisciplinary projects. It allows for input from all the participants and helps motivation. If the time available to solve a problem is short, it should not be used. Project leaders, however, should beware of continually operating at a crisis level. They should anticipate major problems and allow time for participation and other planning. The approach will not work if the leaders are negative about it, are unskilled in its use, or if the staff resists. The field project leader should be particularly concerned if the latter situation exists. If the leaders themselves (project manager and deputy managers) would like to use participative management and the staff resists, it may mean the staff does not understand project objectives, is apprehensive about the results, and, consequently, is not willing to share responsibility for the project.

In participative decision-making the leader should be strong in implementing the decision. An advantage of this kind of leadership is the project staff is likely to be very supportive of decisions that are made. Even if the decision is wrong, there is less tendency to blame someone because the process used to determine it was valid. Consequently, the error will be treated as a new problem to solve with the method.

### Communication and Feedback

It is essential that a good interdisciplinary staff have effective communications. In Chapter II it was mentioned that project staffs are more equal in authority than other staffs; consequently, there is more cross-communication. This equality requires that project staff tell, ask, question, inform, correct, support, and help each other more than in most work situations.

Effective communication helps develop respect for colleagues and gain an appreciation of another's work. Staff should accept responsibility to confer with each other and express their opinions. They should ask questions when they do not understand, aid in educating one another, and be facilitating when others are trying to learn a new idea.

An important kind of communication in any organization, but especially with a project, is giving and receiving feedback. Feedback is the check on communications that are sent or received. Feedback is necessary because the meaning intended in a message is not always received by other persons. Additionally, what is being communicated by the sender is influenced by body movements, gestures, voice inflections, eye contact, and other subtle motions. Receivers of the communication use their expectations for meanings, the context of a communication, and distractions that occur to interpret the message they receive.

Communication cannot be avoided even if a person is not talking. If an individual is silent at a meeting what may be communicated is resistance to the idea being discussed, personal worries, preoccupations with other project work, or unrelated thoughts.

In spite of these facts, most people assume they are communicating well and are not usually aware when their communications have been unclear. Leaders have to promote good communication, and developing a feedback system is one way to assure its accomplishment.

To be certain a message has been communicated, the sender should ask the receiver to repeat the meaning of what was said. The receiver can also initiate the checking process by stating the meaning is unclear and the receiver would like to restate it to confirm its meaning. The cycle of feedback is to send a message, have the receiver repeat the meaning received, and then have the sender affirm the meaning is correct or incorrect. This is a three-step communication pattern, and although it can be awkward, it should be used frequently and for all important communications.

Another meaning of feedback is the evaluation of and response to the behaviors of other persons. Positive feedback recognizes an accomplishment and negative feedback points out an error, inadequate work,

or some other negative criticism. An honest and constructive balance of positive and negative feedback is desirable.

Giving positive feedback is pleasant and useful. Positive feedback reinforces the kind of behavior that has been evaluated; makes the behavior likely to continue; clearly defines what the sender considers good work, which may be previously unknown to the staff; makes the receiver feel good and increases self-esteem; makes the sender appear positive; and increases the morale of the entire work group. Despite these benefits, it is surprising how infrequently positive feedback is given. Some reasons for not giving it are that it is assumed the other person already knows the information; that leaders should stay distant from their staff; the other person will interpret the feedback as manipulation through flattery; or it is inappropriate to say anything that will initiate a show of feelings at work.

Negative feedback is harder to give but it is also essential. Without negative feedback neither a project nor the behavior of its staff can be corrected. Some reasons for not giving negative feedback are that it will hurt the other person, therefore, telling them something to make them feel good or even telling them nothing would be better; lead to pain for the sender since most people fear being viewed negatively; take a long time to do because the information cannot be given without additional confrontation; and lead to anger which is undesirable when expressed at work.

The way to cure antipathy toward giving feedback is to learn how to do it competently. There are several guidelines that make giving both positive and negative feedback effective. First, in giving feedback to someone, the readiness for reception should be assessed by asking the person if they are willing to listen. The behavior in question should be described, rather than evaluated, and the person should be told what they did and its impact.

The person giving the feedback should not try to interpret why a person did something. Interpreting motives establishes the sender of the feedback as "all knowing" which may offend the receiver. Saying why a person did something presumes the giver already knows the answers to issues the receiver has yet to resolve.

The one giving feedback should not offer advice but should share information. The sender can ask what the receiver intends to do about the feedback, especially if it is negative, but it is best for the first suggestions of action to come from the receiver. The sender can discuss options for corrective behavior, but if possible the receiver should be allowed to choose his own action.

The feedback should describe specific behaviors and not make generalizations about the receiver. For instance, it is poor practice to say, "You always come late to meetings." A better approach is, "You came late to this meeting, and you were also late to the last two meetings. That has caused us to not accomplish what we had intended to do." It is best not to refer to a trait of a person when giving feedback. For example, "You are an angry person" should be replaced with "You have gotten angry at three people, Ali, John, and Mary, during the last two days, and the consequences of your anger have upset our schedule for accomplishing our objective."

Feedback should be given soon after the behavior occurs. If it is reserved until the annual performance appraisal, it may lose most of its effectiveness.

Feedback is often most effective if the receiver has communicated a desire to be evaluated. An ideal situation is when project members trust each other enough to ask for feedback from one another.

Feedback should be checked to ensure it is accurately heard. This is especially necessary with negative feedback since receivers tend to reject it or make broad generalizations. A person who received negative feedback and applied it to more situations than for which it was intended is "overgeneralizing." The sender of the feedback should ask the receiver to repeat the message so it can be determined if the receiver is overgeneralizing. If a receiver says, "Oh, I guess that means that you think I never do a good job around here," and the sender did not mean such a broad statement, the message should be repeated, reemphasizing the specific situation to which the feedback applies.

Giving feedback in a group situation is especially compelling and should be done after the group members gain some trust for one another. The senders and receivers of feedback should be able to say that if the feedback was not given, the receivers would not have known

something about themselves that they needed to know. Withholding the information from an individual may inhibit group performance. The needs of the receiver should determine when feedback is given, but generally, frequent feedback improves teamwork.

In many countries a direct approach to communication is not common. In some cultures if feedback is given at all, it is given through a third party and is colored by politeness more than by an effort to help the receiver. Leaders of the project need to evaluate the culture and decide how to best develop a feedback system. If it is determined to give feedback as advocated here and the leaders have had no previous experience using it, training may be scheduled as part of the orientation.

Another method of communication on a project is through written messages. Often, messages are written so poorly that they are unclear. Another problem is that many leaders communicate too many things verbally and do not record enough communication on paper. Topics about which leaders should write communications are policies, procedures, job descriptions, accountability steps, instructions, and agreements at meetings. It is also good to notify people in writing of intended actions. For instance, the agenda for a meeting may be printed and distributed to the participants for use before the meeting. Later in the project, report writing will be facilitated by the written record of accomplishments, agreements, and actions. Written communication should not replace good, informal, verbal communication, but should be supplementary.

Maintaining good public relations is also an important objective of communication. Most donors and other organizations require formal reports from the project leaders. The project leader should also keep other influential organizations and individuals aware of the project's progress. Communications can be through formal reports, but is often more effective when accomplished through channels that encourage feedback such as personal visits, telephone calls, personal letters, or a brochure describing the project, accompanied by a request for comments and suggestions. Inviting concerned and influential persons to the project site to observe the progress and communicate directly with farmers and project field staff is often one of the best means for fostering public relations.

### Conflict Resolution

Every project staff will experience conflicts among its members, and possibly between the staff and persons outside the project. Depending how well the staff resolves its conflicts, it will become an effective group or fail to become a cohesive unit.

Conflict is something that most persons prefer to avoid and hope it goes away by itself. However, conflicts must be solved and conflict resolution can be a means by which staff come to understand each other. Conflict resolution can assist group development because the members learn they can deal with difficult issues successfully. Resolving a conflict often clarifies perceptions of problems and stimulates new ideas.

An important concern about conflict is that the conflicting persons believe they must win and the other must lose before satisfaction can be attained. Some situations are designed to be "win-lose," such as in bargaining for an item of merchandise in the market. The seller states a price for the item and the buyer offers a price. The difference between the two prices is what the buyer and seller negotiate, and whatever the seller gains the buyer loses, and whatever the buyer gains the seller loses.

Many other situations are characterized as win-lose, but they can be more positively resolved. The bargaining situation is win or lose because there is only one thing being sought; the difference between the prices of the seller and the buyer. If other elements entered the bargaining, such as the opportunity for the buyer to use credit, or the promise of maintenance on the merchandise by the seller, or even an understanding that the purchaser would return later for other purchases, the nature of the situation changes. When many benefits are considered, it is possible that both the buyer and the seller feel as if they won, and they both may have. The situation must be creatively approached to determine what gains the contesting parties can obtain from each other at relatively low cost. This is the general idea of conflict resolution.

Another negative orientation that people can have when approaching a conflict is the desire to punish the other individuals. This may be illustrated by the story of an angel trying to help a

mortal understand the principle of shared benefits who promised the mortal anything he wanted with the understanding that the mortal's competitor would receive two thereof. After some consideration the mortal requested "one glass eye!" This orientation may be defined as lose-lose, because the person who controls the outcome does not hope to win anything; but only lose less than the opponent. To move people from this orientation to a position where they believe they both can win is difficult, but is often the element essential for a project's success.

There are many commonly used ways of handling conflict, most of which are ineffective. Avoiding conflict is not good since the issues are unresolved and continually occur, getting bigger and more intense over time.

Fighting as a means of handling conflict is usually ineffective. Fighting is generally lose-lose, with the losers remembering their losses for a long time while the winners become complacent. Fighting generally escalates the conflict, although an emotional venting of feelings that seems like fighting is often a necessary first measure in resolving conflicts.

Some managers try to eliminate the conflict by exercising their authority by saying, "I'm getting tired of this problem. You quit arguing, because I say so." This is seldom successful but is commonly used. The problem may be hidden when the manager is present, but reemerges later. The technique may remove the conflict temporarily and give the manager more time to be involved with other matters but does not resolve the problem. Since the persons involved in the conflict are not committed to finding a solution, this approach does not facilitate teamwork.

A similar kind of approach is to establish rules to resolve frequently occurring conflicts. For example, "the older workers will get the new equipment," or "men with families will be given the first choice of housing." The problem with this approach is that some rules are outdated or may not apply to the situation. The use of a rule curtails the discussion of a conflict and the reasons for conflict may not be approached. Many conflict situations are complicated and rules may not cover all the needs of the persons involved. When rules are used to resolve conflicts, contending persons may be left unsatisfied with the

resolution. In spite of these limitations, establishment of objective, impartial rules can effectively reduce conflict. Careful consideration and development of such rules is essential.

Another common method is to use majority rule to resolve conflicts. This would appear to be a good method but is not if the majority decides to call for a vote whenever it is bothered by a conflict. Voting without a complete discussion of the conflict is a win-lose situation. Voting when the majority knows it can win is a tactic for suppressing the discussion of an issue. Voting polarizes the group and may not allow the conflicting parties to understand the other's positions. If there are consistent losers in voting, there is a threat they will establish a group that could hinder teamwork. It is sometimes good to design groups so they have trouble settling their issues by close votes. One way to do this with small groups is to have even numbers of participants in a conflict resolution meeting. Another way is to disallow voting and require a consensus.

The use of minority rule is another, seemingly unusual way to resolve conflicts. The minority is usually a group of vocal, dominant members, often including the leader. They often go to meetings well prepared to advocate an idea. They propose their position clearly and forcefully, and may even ask for questions. Other persons who are not as dominant or well prepared may not ask questions for fear of appearing uninformed. When this happens, it is possible that no one will speak against the recommended means of resolving a conflict, although the majority of the group may be opposed. This condition is a reason why the leader must not accept silence at a meeting as representing agreement. The minority may then request the problem be handled their way since no opposition was voiced. It is obvious that the group must guard against minority rule, and to do so requires persons willing to provide feedback to the group when this process occurs.

Compromise is a typical means of resolving conflicts but is not necessarily good since the conflicting parties can usually win only a part of what they want. It is similar to the buyer and seller in the bargaining situation, only their viewpoints (rather than price differences) have to be negotiated. For compromise to be an effective conflict-resolution approach, the negotiations must include a variety of

potentially good outcomes for the groups to consider. Only then is it likely that the conflicting parties can make an agreement that will be satisfactory to everyone.

A final way of resolving conflict involves the use of third parties for a judgment about an issue or help in conducting a conflict resolution meeting. Many organizations have a grievance procedure that is utilized when conflicting parties cannot resolve their differences. It usually involves setting the conflict at a higher organizational level, and finally by an arbitrator, a person acceptable to both groups who will act as a judge and determine how the problem should be resolved. There are problems with this method. Conflicts are most easily resolved between those involved. If conflicts go higher in an organization they tend to receive more publicity, get bigger, and become more legalistic. When conflicts go into grievance procedures they generally become win-lose or lose-lose situations. When someone else decides on how to resolve the conflict, those concerned will usually get less than if they worked together to arrive at an agreement. Most arbitrators are concerned primarily with disposing of the case efficiently, and concerns about the needs of the conflicting groups will usually be of little importance in their decisions. The outcomes of arbitration are difficult to predict and can be quite upsetting to those involved. The most serious criticism is that the reasons for the conflict are not resolved and the conflict may emerge again later but somewhat changed.

There are two other ways of using third parties to help resolve conflicts. One is to use a mediator. If the conflicting groups are so angry they cannot speak to each other, a mediator can carry messages back and forth and try to find points they would be willing to discuss. This method is often necessary, but getting the groups to communicate should be viewed as only a first step to conflict resolution, not resolution itself.

The most effective use of a third party is a facilitator who presides at a conflict resolution meeting. The conflicting groups and the facilitator must meet together. The facilitator's function is to ensure that groups completely present their sides of the issue, and that the messages are understood by all. Feedback skills are important and the facilitator may ask each side to repeat the other side's position to ensure they understand. The facilitator should seek an honest and

complete interchange of feelings and viewpoints. It is good to record all the ideas presented. The facilitator should make sure a complete discussion is held and that agreements are made before dismissing the meeting. A follow-up meeting may be scheduled to reevaluate the progress toward resolution.

Several procedures may be used by a project manager or field project leaders to coordinate a conflict resolution meeting among members of the staff.

1. The meeting should be called and labeled as "a conflict resolution meeting" so those attending have appropriate expectations.
2. Honesty and frankness are essential at a conflict resolution meeting. At the meeting anger and other expressions of feelings should be allowed and even encouraged. People in conflict are often angry or hurt, and to deny such feelings casts an aura of dishonesty over the meeting. Even if voices raise and tears are shed by one side they help the other side understand the intensity and emotion involved in their position.
3. Next, the goals of the meeting should be defined along with expectations of the meeting. Each group should be asked what they would like to have happen for themselves and for what reasons. The desired results for each person should be listed before any decisions are made.
4. The project leader must be alert to the conflict resolution orientation held by the participants and direct them to a win-win view. Outcomes that can be shared by the groups must be determined. It is important to find ways in which cooperation will be mutually beneficial.
5. At this point conflict resolution should be considered a creative problem-solving exercise--"We have a problem and what can we do about solving it?" Facts should be gathered and discussions of personalities or "we-they" differences should be avoided. Facts should be checked without questioning the honesty of the persons involved.
6. All the persons involved should be encouraged to contribute to the discussion and their speaking time monitored. The leader should be alert to defensiveness about discussing the issues openly. An atmosphere should be developed in which participants feel they may speak frankly about all aspects of the conflict with no negative consequences to themselves.

7. A consensus solution is most desirable because it will be followed most completely by the participants. In choosing a solution, it is best to avoid voting, having one group give in on one point if the other will give in on another, flipping coins, or compromising. All of these things eliminate necessary discussion. Additionally, the leader should not allow anyone to relinquish their ideas to go along with a more powerful adversary.
8. In general, it is necessary to monitor the progress of the meeting and stop it when anyone feels excessively uncomfortable or if the participants would like to discuss a different focus.

These procedures should continue until a solution is attained, even if other meetings have to be called.

### Managing Through Goals and Monitoring

The accomplishment of the project objectives are the responsibility of the implementation staff. After the project manager is hired, the general objectives should be refined into a series of procedures that lead to their attainment.

Once the whole staff is assembled, the objectives should be refined again. At a preliminary meeting of the technical leaders and administrative persons, the project manager should discuss the basic purpose of the project and present the objectives and work plan. Persons at the meeting should consider the resources available including money, skills, and cooperation with agencies, along with the problems that must be overcome. They should determine the feasibility of meeting the objectives and utilizing the existing plan. In addition, the group should determine whether project objectives will be met if all the procedures delineated in the work plan are accomplished.

The staff must organize the project into task forces, a group of people temporarily assembled to work on each subgoal leading to a major objective. The task force organization model is commonly used when management-by-goals is practiced. The staff must decide if the amount of time demanded of each person for each procedure is appropriate, and determine whether some people and resources will be overutilized while others will be underutilized. Persons and resources should be tentatively assigned to each task force. The assignments must ensure that the work be accomplished with the appropriate amount of effort.

The technical and administrative leaders should present the tentative work plan to their own staff units for discussion. It is possible that questions may arise about the estimates of time or cost to complete a job. In addition, the staff may delineate problems of which their supervisors were not aware. They may question their own ability or even their interest in accepting responsibility for completing a task. The work units should offer suggestions for revising the work plan. This participative involvement is essential for successful management.

Revisions made in the work units should be discussed at the project leaders' meeting. Once again, the leaders must examine the proposal to see if all the project's goals will be efficiently accomplished. The leaders may approve some of the proposed changes and disapprove others. Some negotiation may be needed with the work units before a final plan is accepted. When accepted, the project manager should issue a written statement of the plan to the work groups.

Each work unit should then establish their own group goals and individual goals with the assistance of their supervisors. The individuals' goals can cover five categories.

1. Goals that directly support their group or the project goals. Everyone must have some of these goals to justify their position on the project staff.
2. Goals that apply to the routine work in the project. For instance, the project secretary might have a goal about the accuracy of his or her typing, and an engineer might have a goal concerning the number and precision of water flow measurements that he or she will take.
3. Problem-solving goals. These usually will not be a concern until later in the project, but their purpose is to resolve a problem being faced by the person or the project. Conflict resolution goals would fit in this category.
4. Innovative goals. These, too, may not be considered until later in a project. However, a person may have an idea for changing and improving something, and the expected results can be a goal. These goals are somewhat risky, and the person's supervisor should accept them carefully and be somewhat lenient in evaluating their accomplishment. Innovative goals are necessary in most organizations to help accomplish change.

5. Personal or project development goals. Everyone should have some goals that help them feel good about themselves and aid their personal and professional growth. These goals can refer to skill development, training for another job, or just enjoying work more. Project development goals can refer to improvements in the resources of the project, such as general training or enhancing morale.

Goals should be stated as an expected result to be accomplished by a certain time. They should be measurable so it is necessary to specify how they will be evaluated. The individual should state how their goals will be achieved and their supervisors should describe how they will assist their employee in their accomplishment. An assessment should be made of the resources available to meet each goal, and if the resources are not available, the supervisor may want to help in their attainment. Finally, the cost of the goal in money, time, inconvenience, and stress should be compared to its potential benefits to determine whether it is worth the cost. It may be necessary to lower the magnitude of a goal if it is too costly as first stated.

Once the project, work unit, and personal goals have been set, it is necessary to frequently determine the progress being made. If the indicators have been chosen well, individuals can often assess their own progress and decide how to improve themselves. This is called self-control as opposed to management-control of goals where the leader tells individuals about their progress and how to improve. Most personnel will be more motivated if they can monitor their own progress and correct their own performance. Management should receive summary reports of goal attainment by individuals and work units.

Progress toward the general project objectives must be continually measured which requires evaluating the physical progress of implementation, as well as other indicators of the effects of the project. This requires designing and using a data management system to record indicators of goal progress.

In general, the progress toward goals must be evaluated considering several aspects and utilizing various methods. Project staff should meet frequently to determine if the project is proceeding effectively, and to make adjustments if progress is not sufficient. A "management by exception" approach should be adopted. This means that goals not being met should receive special attention. They may

require additional resources, a new work design, or, in some cases, it may be necessary to change the goals if they are unattainable as stated. Monitoring goals is a continual process as is assessing the project as based on progress reports.

Establishing goals should be a periodic process throughout the duration of the project. Goals may be established to cover relatively long periods but it is usually better if goals are attainable in a relatively short time. People like to see progress, and too many long-term individual goals may leave the individuals without recognizable indications of success during the interim. When first using management-by-goals, it is good to list only a few short-range goals for each individual, and then establish more goals in succeeding goal-making sessions.

When practicing management-by-goals, the likely organizational form to use is a matrix model. Staff members from different disciplines will be assigned to several temporary task forces to accomplish various goals. Most persons will be members of several task forces at one time. An individual's achievements on the task forces must coincide with the other members' to produce goal attainment for the whole group. Under this system, a person may have personal goals that apply to several different task forces. The project leader must assign persons to lead each task force, and have them be responsible for producing progress data on the group's goals. Two good references on the use of goals in management are: Anthony R. Rajia's Managing by objectives, and Paul Mali's Managing by objectives: An operating guide to faster and more profitable results.

### Managing Cross-cultural Issues

Cross-cultural problems can arise in several types of relationships including foreign and host-country persons, members of different cultures within the same country, and members of various disciplines on the project, each possessing different views of the world. Sensitivity, participation, good communication, conflict resolution skills, and an ability to manage from goals are required to handle cross-cultural issues. It is helpful if the staff is willing to examine their perception of themselves and other persons, and to try new ways of relating to people from cultures other than their own.

Cross-cultural sensitivity does not happen easily, and for some people it may not be possible. Project leaders should be aware of certain personality characteristics that interfere with an ability to attain cross-cultural understanding when project teams are selected. Persons who demonstrate prejudicial attitudes or are rigid about accepting new ideas are unlikely to be sensitive to others. Sometimes, persons who are insecure have trouble accepting other persons' opinions and should not be considered for projects dealing with different cultures. Generally, cross-cultural sensitivity can be enhanced for most people if they are willing to make some effort.

If appropriate, cross-cultural issues should be a main concern of the staff as soon as all members are selected. It is common for cross-cultural issues to be avoided during project initiation with the anticipation that "they can be learned as we go along." However, there are at least three problems with this approach. First, team members will not learn enough about cross-cultural issues unless they are considered important at the beginning of the project. Impressions of other people are established early during contact with them and are difficult to change. It is best to emphasize the importance of cross-cultural issues early and to devise a learning program that includes the issues. Second, it is difficult to design organizations to continue the project after the funding ends without shifting from project procedures to the methods used by the people who will continue and expand the original staff's work. This transfer can involve many cross-cultural adjustments between the old staff and the new one with respect to accepting the project innovations. This potential adjustment should be considered throughout the duration of the project. Third, cross-cultural issues can be obscure unless they are delineated. The issues often result in frustration, disappointment, despair, and even personal depression, but generally they are thought of as only minor distractions that inhibit project effectiveness. One isolated issue is usually not considered important enough to be on the agenda for a meeting. When the issues do become big, they are difficult to handle, and for these reasons, cross-cultural awareness and sensitivity should be a continual concern.

The project manager should induce cross-cultural understanding in the headquarters staff. In the first meetings the manager should emphasize the excellent opportunity available for the personnel to learn

from each other because of the different kinds of persons involved with the project. The manager should refer to the objectives of the project, and how meeting them will require using everyone's skill and effort. It should be stressed that the staff will not always understand each other because of cultural differences, but one of the goals will be to minimize problems resulting from these differences. If the manager feels comfortable in doing so, he might ask for the group's advice on how to attain sensitivity toward each other.

The manager should suggest that one way to facilitate understanding another person's position is to practice good feedback techniques. Staff should develop ways of discussing issues that are confusing or bothersome. In addition, feedback should be used to assess their impact on others involved with the project. This approach will work only if the manager of the headquarters staff will use and accept these methods as the acceptable way of behaving. It is helpful if an exercise on a cross-cultural issue can be used to help establish the technique of giving and receiving feedback with actions as well as words. A manager might use an outside facilitator to help coordinate this attempt.

Another area of cross-cultural concern involves the prejudices or beliefs that individuals hold about their own and other ethnic groups. It is likely the members have stereotyped views of persons who are from other ethnic cultures or disciplinary areas, and unless discussed these views could harm group effectiveness. The staff perceptions of the cultures affected by the project can be described in group exercises and modified by feedback. One way of doing this is to have members of each ethnic group describe themselves with a series of adjectives or short phrases on a large piece of paper. Then, they should describe the members of the other groups using the same method. Finally, they should write how they think they were described by the other group(s). The groups should discuss the perceptions of one another to help each other understand their views. The end result of the exercise, hopefully, will be a greater awareness of the perceptions and differences in views that do exist and some action steps for using this knowledge. Again, a facilitator is useful in conducting such a meeting.

One thing that can cause great problems in cross-cultural settings is the different assumptions that people have about what the world is like. Assumptions of how people operate, what is good and bad, and what is acceptable behavior come from one's culture. These assumptions are so accepted it is often hard to understand them or be explicit about them. Nevertheless, judgments of other people are made according to these views. Assumptions about human behavior are so strong that people may try to make their perceptions come true about the people with whom they work. This self-fulfilling prophecy can create problems in cross-cultural settings since it encourages individuals to try to make people fit their concept of behavior. When another person's assumptions are different, there is often conflict because they are considered wrong.

The entire staff must openly examine their assumptions and their impacts on others. A way to do this is to state one's assumptions as explicitly as possible and to see if persons of other cultures have similar or different assumptions. Some areas which should be explored are what motivates people to work; the possibility for positive change; the worth of different kinds of people including males, females, young, old, skilled, or unskilled; the importance of status and differences in status; the basic rights of different kinds of people; the inherent goodness of democracy or any other form of government and management; the value of direct feedback; and the rules of justice. This list is not all-inclusive, but these particular areas differ greatly across cultures and create conflict when persons of different cultures do not understand each other's positions. Staff must become aware of their own assumptions and others' or else they will not understand why certain behaviors occur on the project. Relying on feedback from individuals of all the cultures represented on a project is useful in testing assumptions.

Cross-cultural learning is not easy to accomplish. Much of it can come from the desire of the project manager, field project leaders, and staff members to do it, along with some well-designed learning experiences. Additionally, much sharing and sensitivity can occur if the team members from different cultures share leisure as well as work experiences. It is a good idea to share meals, attend cultural events together, and to develop friendships across cultural boundaries as much

as possible. What happens all too frequently, however, is that cliques form among ethnic and/or disciplinary groups and many opportunities for cross-cultural learning are lost. Members from different disciplinary sub-cultures should strive to take field trips together and formulate solutions to problems with each other's assistance. Members representing different ethnic cultures should try to convey some of their cultural heritage by planning group dinners and other recreational events to celebrate their holidays and to convey important social meanings. At least basic language training would be of significant value to the staff if the language is unknown. Also, reading novels and scholarly works, attending plays, movies, musicals, and other cultural events will provide more cultural insight. A final suggestion is that certain persons on the staff should be assigned responsibility for designing cross-cultural learning experiences so that new issues can be covered and learning can be continuous.

## STAFF TRAINING

### Need for Training

Assistance for the farmer, particularly the small land owner, is a major purpose of on-farm water management programs. In order to provide farmers with agricultural skills and improved water management practices, project staff need training in agriculture and water management; interaction with farmers; organizing farmers; and specific technical skills required for the various tasks involved with project implementation. In addition, some type of extension service staffed with personnel adequately trained in agronomic and irrigation practices is required continually to ensure the long-term benefits of the project. A close association between the research and extension organizations is important if maximum effectiveness of the agricultural infrastructure is to be realized. Research and development of improved farming methods along with testing the results on farmers' fields, followed by extending this information to others is a valuable training experience. Experience with irrigation projects shows that when adequate agricultural inputs, staff, and extension services are not continually available, physical improvements are often temporary and the intended project benefits are never fully realized. When the field staff is adequately trained, there

is the confidence and capability to implement the project objectives more effectively, and direct the use of the agricultural inputs and services to the farmers' benefits. Some principles for establishing water management training programs are listed.

1. Field professionals are required with in-depth water management skills, rather than being agricultural generalists, in order to effectively implement a water management project.
2. The project work plan will list project activities and tasks along with projected personnel requirements, with initial emphasis on providing only the necessary field training required to get the project under way.
3. In the initial stages of project implementation, likely candidates for trainers are those that have been involved with the Development of Solutions phase.
4. Probable sites for the initial training programs are those locations used for field testing in the Development of Solutions phase.
5. Strong consideration should be given to "institutionalizing" the training program by emphasizing utilization of existing training centers, experiment stations, and universities.
6. Attempts should be made to increase the capability of the agricultural universities to provide training in irrigation water management practices including agronomic practices, watercourse improvement, land leveling, irrigation methods and practices, farm management, interacting with farmers, organizing farmers, developing extension techniques, and other related areas.
7. In order to improve the image of the extension component of the project, new titles combined with in-depth training are often required to develop farmer confidence and establish credibility.
8. A farm level Water Management Advisory Service staffed by Water Management Extension Specialists should be established to assist the farmer irrigation associations. This service can also provide long-term continuity for improving on-farm water management practices, as well as providing the major linkage with the farm community during withdrawal of project resources.
9. Special consideration should be given to developing more effective linkages and feedback mechanisms between the farmer, extension specialists, and the agricultural research institutes. Particular emphasis should be given

to conducting trials on farmers' fields to gain greater sensitivity to the problems and constraints encountered by farmers, strengthen existing agricultural research programs, and provide for long-term increases in agricultural productivity.

10. Short training programs of a few hours, days, or a week should be initiated for administrative personnel to develop "water management awareness" among all agencies and personnel having a role in increasing food production.
11. The training program for project staff should have a "continuing education" component.
12. Rewards, awards, and incentives can be utilized to recognize project field personnel who effectively use the skills acquired from the training program.

### Concepts of Training

The basic approach to training project field personnel should be teaching problem-solving skills under actual field conditions. This approach involves problem conceptualization and identification, and acquisition of essential techniques required to help farmers solve water management problems. About 75 percent of the training time should be in farmers' fields. Many of the required skills should be taught by conducting actual water management activities in villages.

Special training materials will be required and the medium of instruction should be the local language. Emphasis should be given to using visual aids, maps, charts, case studies, problem sets, result and method demonstrations, simulation, and practical experience. Trainees should be provided materials such as written outlines and notes to develop their own field books. As much as possible, these materials should be developed from local data.

Existing training facilities can be utilized or new training centers can be established. Existing facilities may be found in the Agriculture Department, the Irrigation Department, the water resources planning and development agencies, the agricultural universities, or the agricultural research institutes. A major advantage of using an existing training center is the possibility of obtaining the assistance of their staff in conducting all or a portion of the required training. Their participation could serve as a catalyst to encourage such staff to

develop increased capabilities of their own for doing training in on-farm water management related subjects. In addition, as a long range strategy, part of the project could include training selected university staff in several departments such as agronomy, agricultural engineering, economics, sociology, and extension about water management principles and methods. Having selected staff members trained under the guidance of the project could also be attempted with the agricultural research institutes to strengthen their capability for conducting water management research. At the time the project is terminated, these training institutes and agricultural universities should be capable of continuing to contribute certified graduates for other water management development projects.

The training to be done, whether at an existing center or institute or through the project itself, will depend upon the skills required for different job assignments. After formal training mostly in the field, on-the-job training should be required in which the trainee assists in doing evaluations, planning for improvements, and handling other phases of the project. The length of training time at a training center should be minimized so the trainees can quickly proceed to on-the-job training and become active participants in project implementation. The field project leader will designate the field supervisor of the trainees who will also participate in each individual's evaluation. After the successful completion of a formal training course and on-the-job experience, an official certificate should be awarded to each participant.

Procedures for selecting and evaluating trainees should be designed. Criteria such as work experience, farm experience, interest in training, educational level, among other aspects, should be used for selection. Performance evaluation methods should be designed to use during the training, after the completion of the formal course, and during on-the-job experience.

Each year, a short in-service training program should be conducted for all water management personnel. This training, done at local sites, should be the joint responsibility of the training center and the field project leader. The training would be a means of updating the skills of each field worker while assessing what additional training is required.

All persons who successfully complete the training should be given salary rewards. Other salary increases should be based on positive field evaluations each year.

### Organization of Water Management Advisory Service

The focus of this section is on the organization of an advisory service which should be a major component of most water management development projects. Because of the critical need for water management improvements in arid and semiarid countries, this service provides an opportunity to begin procedures and activities to strengthen the existing extension system to meet these needs.

There are some universal worldwide problems in irrigated agriculture that the concept of a Water Management Advisory Service is designed to help overcome. First of all, there is a preoccupation with the construction of dams, canal lining, and installation of pumps while on-farm use of water is almost ignored. Secondly, once the construction is complete, there is a service problem, and in many cases, inadequate maintenance.

A Water Management Advisory Service is needed to direct more attention to the proper use of water on farmers' fields and then encourage maintenance of the physical facilities. Water Management Extension Specialists would work with farmers to facilitate improved on-farm irrigation practices made possible by the physical improvements resulting from the project. Some of these specialists would continue working with the farmers after other project personnel have departed to advise on proper maintenance procedures of project facilities.

The designation "On-farm Water Management Advisor" or "Water Management Extension Specialist," rather than "extension worker" is used to name staff in the Water Management Advisory Service since their training and functions are different from that of the traditional agricultural extensionist. It is proposed that persons selected for this position be obtained from current Extension Service field staff and/or job applicants with equivalent academic training, and that they be given intensive in-service training on skills required to help farmers organize and implement improved water management technologies. Intensive training at a university in water management can substitute for training

done by the project. Effectiveness of the university in preparing trainees for field work will depend on whether the university teachers have experience in the field and with problems that extension specialists will encounter. If the university professors do not have such experience, nor teach such courses, the project manager should encourage the faculty to gain field expertise working with project implementation. If faculty members are unavailable for such assignments, the project should attempt to qualify successful participants in the field program for positions on the university faculty so they can provide this expertise.

There are several alternatives on how a Water Management Advisory Service can be organized. Although a new organization can be designed that has responsibilities for farm-level advisory services, an improved program under the existing extension service in the Agricultural Department should be given first consideration so that the capability of the organization can be strengthened. Because of the recommendation that organizing the farmers into irrigation associations is an essential part of the total project (see the section "Organizing Farmers" in the next chapter), the advisory services organization should be designed with linkages to these associations at various organizational levels. As project results dictate, improved crop production practices may require development of other farmer groups with similar interests such as commodity groups to sponsor and perform specific services. These organizations should be closely allied with one another, which can be coordinated through efforts of various extension specialists.

The Water Management Advisory Service should have contacts with research and other support institutions. Figure 6 shows some of the more important linkages that are described below.

1. Farm level advisors must identify closely with the water users' associations. Many activities will be directly related to these associations such as teaching and assisting farmers in collective activities, as well as influencing the behavior of individual farmers. Some mechanisms should be designed whereby the watercourse federations have some control over the work of the water management advisors so they do serve the majority of farmers.

2. The linkage with the training center is essential for several reasons. After the advisors have completed their formal intensive training they can be assigned for on-the-job experience. The training center, along with the water management field supervisor, should be responsible for the evaluation of each trainee.
3. To support the advisory service, a continuous flow of agricultural information related to water management must be directed to the advisors and the farmers. The Agricultural Department should prepare extension materials in the local language and it should disseminate some materials through the mass media such as newspapers, radio, and television.
4. Another linkage is with the Irrigation Department which usually has the responsibilities for the irrigation delivery system. To foster the support of the Irrigation Department for on-farm water management development projects, engineers and assistants should be provided by this department to help improve water delivery. Additionally, the project should provide training to those engineers and assistants about on-farm water management issues. These participants would be told that they could provide information about delivery schedules as well as rules of operation essential for helping farmers to realistically plan and reduce risks. In turn, Irrigation Department personnel should be asked to give lectures or field training at project training courses to help the staff understand the relations between farmers and the rules of the Irrigation Department. The trainees should have an understanding of the function and goals of all Irrigation Department personnel who deal directly or indirectly with farmers. There should be coordination between the Irrigation and Agriculture departments and with the irrigation associations.
5. No farm extension or advisory service can be effective without strong contacts with research institutes involved in developing improved crop production. A linkage could be developed with major research institutions through a water management research specialist assigned to selected research centers. This specialist could provide research findings to the field supervisors (Water Management Extension Specialists) who make that information available to the advisory service workers in a form that can be used with farmers. An attempt should be made to institutionalize water management research at institutes to ensure the evolution of water management systems, equipment, and concepts that will continuously facilitate improved water management and crop production practices.

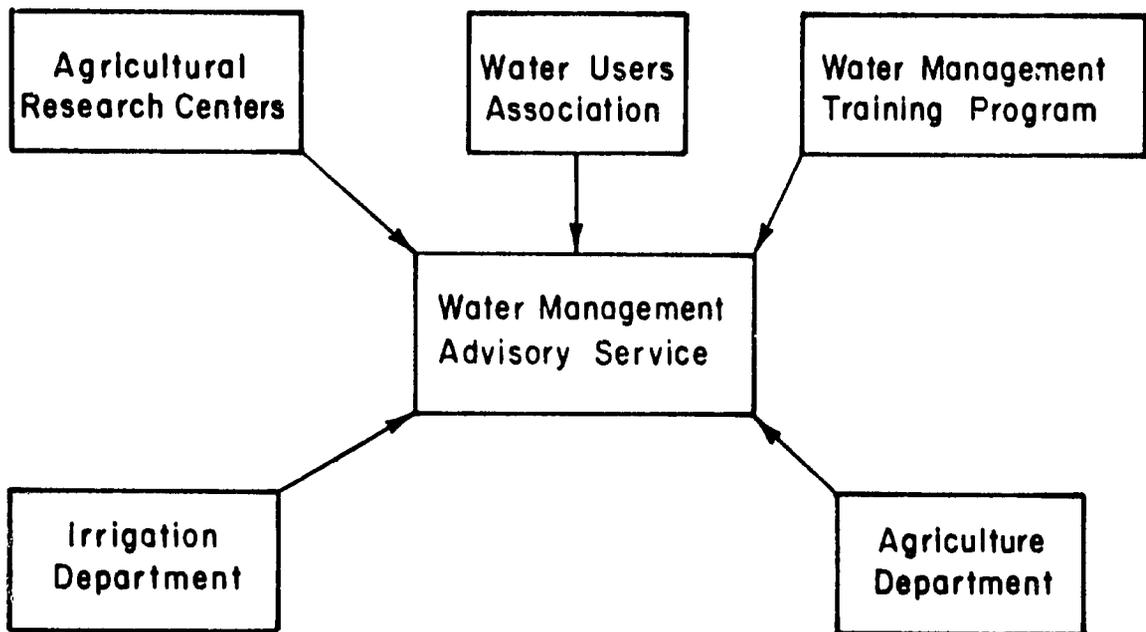


Figure 6. Linkages with Water Management Advisory Service.

6. Though not shown as a linkage, it may be important to assure a credit program operated through the banks for small land owners in the development areas. As development activities are initiated, the demands for fertilizer, land leveling services, and farm implements should increase and require investment by the farmers. Development programs for improved water management seldom reach their potential for farmers unless necessary inputs and services are available with adequate credit arrangements.

## CHAPTER IV

### PROJECT EXECUTION

To this point, the project has gone through selection of the solutions, techniques, and approaches, hereafter referred to as the "innovation." Having obtained legal authorization to proceed in the designated project area(s), the project manager, field project leaders and staff proceed with the initiation of the major tasks (Figure 7).

Project execution is the task of establishing the desired innovations as integral parts of the agricultural system. While client participation was important during earlier stages, it is the major focus of project execution. Any innovation, no matter how automated or centrally controlled, will require continuous attention by someone. With few exceptions, farmers must adopt new tasks and usually there will be other "off-farm" users as well. It is assumed that farmers and other clients have shared the responsibility for developing the innovations that will be implemented regionally. If they have not, the implementation phase will likely need more adaptation and a longer time to succeed than if clients were involved.

Client involvement must become nearly total for successful project execution. Moreover, if the innovations are to be integrated into the normal routines of farmers, suppliers, processors, marketing groups, extension agents, and various government agencies, the transition to total client responsibility should occur gradually and orderly. The final stage should be when the innovations function under the control of the various users with only monitoring and consultation from project specialists. Those that adopt the techniques are allowed to experience control of the new inputs, methods, and organizations and learn from their mistakes with the help of experts, thereby gaining decision-making confidence that comes through "learning by doing." If there are problems with communication of needs or incentives to accomplish obligations, adjustments can be made to bolster communications, redesign contracts, adapt incentive systems, and motivate through education.

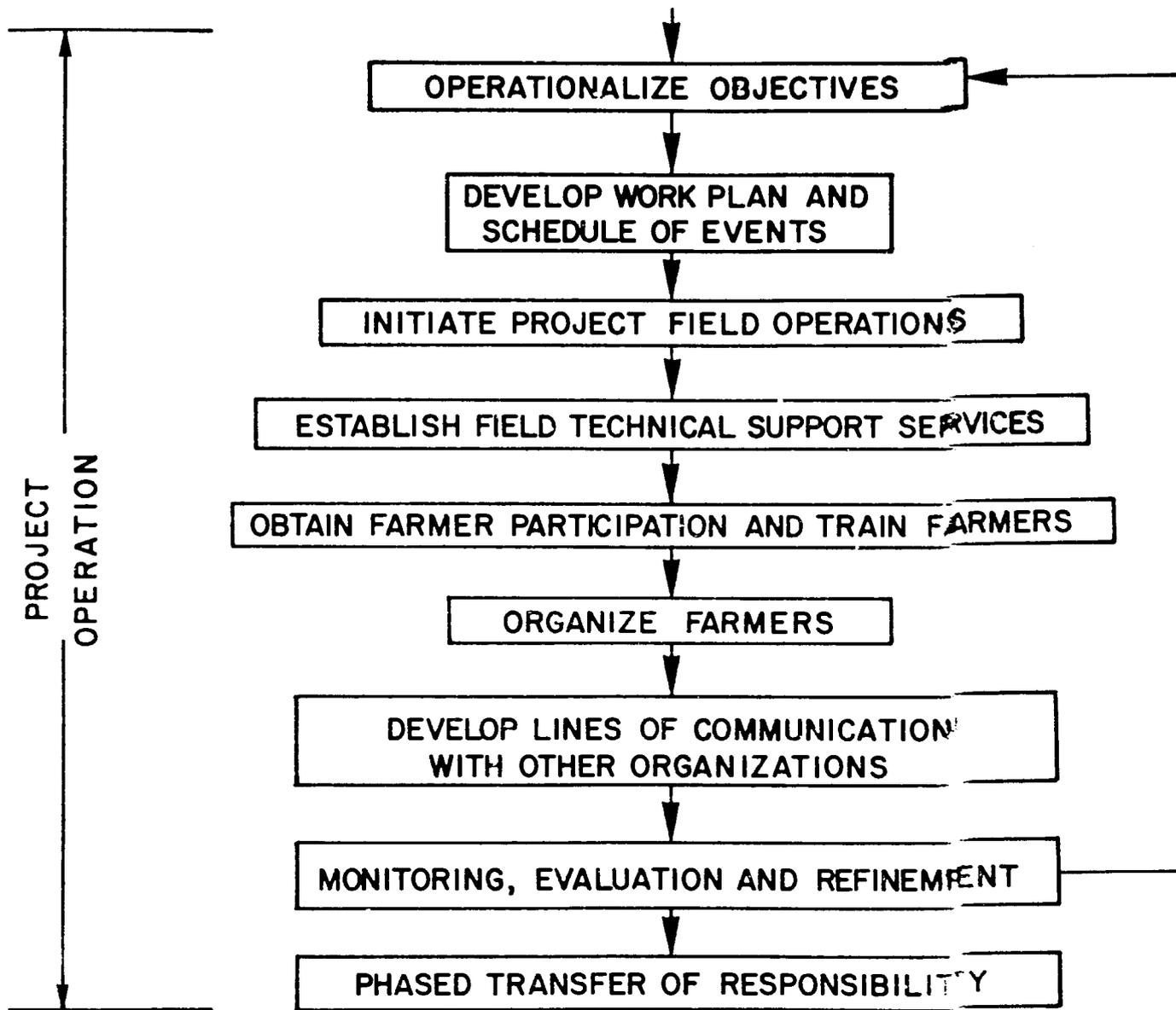


Figure 7. Flow diagram of activities in the Project Operation subphase.

Influencing the project is the social, cultural, political, and technical context that will determine how to execute the project and how well certain strategies for achieving objectives will work. Some elements of the social context, besides the relationships between family and kinship groups, are the local communications and influences experienced by the farmer. The social context can also include reasons for shopping, marketing, and visiting. The cultural context refers to the traditions, values, social rules, meanings of symbols, dress codes, work habits, assumptions about people, the world in general, and the history of the farmers. The political context includes the organized political power system, agencies having power over people, political parties, interests of strong outside groups, laws, the potential for change of political power, or more informal power at the local level. The technical context means the kinds of technologies commonly used or those available for the farmers, the physical and educational resources available, and the space and time in which to do things.

All of these contexts describe constraints to project execution and the adoption of innovation. During the Development of Solutions phase most of these constraints should have been identified and considered before designing the resulting solutions. The final stage of the Development of Solutions phase should have involved a planned withdrawal and preparation of final case histories in which inputs by the government were reduced to the level needed in the Project Implementation phase. In the final steps of the implementation phase, project personnel completely relinquish responsibility to the farmers and leave the project area except for occasional monitoring or to answer requests by the farmers for consultation.

#### ESTABLISHING FIELD TECHNICAL SUPPORT SERVICES

Three common attributes of solutions to on-farm water management problems are:

1. The use of new information or methods by farmers;
2. Their complexity relative to other agricultural innovations; and
3. A need for collective action that requires considerable cooperation.

On-farm water management solutions require more support from outside firms or agencies than do other agricultural innovations. There is also a requirement to transfer knowledge and skills to farmers and for farmers to communicate information to project staff concerning their needs for modification to solutions.

One way to transfer knowledge is through an extension agent. Unfortunately, in many countries extension agents have little credibility with farmers due to lack of expertise, interest, or understanding. One approach to overcoming this low credibility is to develop a few agents who will specialize in the innovations introduced by the project. Because their expertise will be specialized, these agents can be well trained in the technical aspects of the innovations in a relatively short time. For example, use of furrow irrigation might require the extension agent to become capable as a tractor driver, an oxen driver, and a repairer of furrowing implements. If the agent is competent in these areas and can teach others, the agent will be confident in dealing with farmers and will be able to gain satisfaction from the farmers' confidence.

Such mutually reinforcing sentiments are also helpful for training agents to relate to farmers. Perhaps one of the best ways for them to learn is through the example of project staff who are adept at establishing good relationships with farmers. Conversely, the staff can observe the agent working with farmers and give advice concerning the demonstrated approach.

Many innovations require technical services to farmers on a regular basis. Repair and service of tubewell motors, manufacture of concrete outlet structures, precision land leveling, and manufacture and servicing of implements are examples. The two ways for attaining such services are by training private technicians, or training technicians within government agencies. Because the need for service on some equipment can be urgent, it is possible that such services can be withheld by those providing the service in order to extort considerations from desperate farmers. This makes it important to give farmers alternatives such as training the farmers to do basic repairs. Another way is to train enough technicians so there is competition for the farmers as clients. This competition would restrain opportunistic behavior by local repairmen, mechanics, or electricians.

It may be impossible for several technicians to subsist by only serving farmers in the area. Therefore, it may be best to find individuals with established businesses such as blacksmiths, mechanics, or electricians to also repair the equipment. In this way, maintenance of project facilities can become a profitable sideline for established members of the community, giving farmers several familiar sources for service. If government agencies must be used, methods should be devised to motivate quality service and monitor technicians who might be in a position to extort consideration from farmers.

More complex innovations such as irrigation associations require more complex systems of support. Even when user groups become self-sustaining, one of their functions is to provide communication between farmers and technical resource people in the government, the private sector, or nonprofit assistance organizations. Establishment of this communication channel requires either exceptionally talented extension personnel who can relate to both farmers and technical experts in various agencies or some well-educated farmers within each user's association who are capable of communicating problems to agency technicians. Often larger landholders do have such expertise and can utilize technical information. Unfortunately, these farmers are usually regarded by their neighbors as "different" so that their examples are hard or impossible to follow.

The communicative distance between farmers and extension agents or innovative farmers can be reduced through training both groups. Extension agents can be educated to relate to farmers and farmers can be trained in particular skills and knowledge that make them confident in handling change. The importance of this training cannot be overemphasized. Consequently, the next section deals primarily with farmer participation and training.

## FARMER PARTICIPATION AND TRAINING

Project Implementation staff must help farmers involved with the project understand the objectives and the changes introduced. Hopefully, farmers not directly associated with the project will also be positively affected. Some of the work toward these aims will have started during the Problem Identification and Development of Solutions

phases, but implementors of the project will have to complete the work. An important means of gaining farmer acceptance and disseminating an innovation is through the use of farmer involvement and participation.

To determine farmer participation on a project, it is useful to consider the time when the idea for the project was first initiated. Then, if the project was correctly managed, farmers who were likely to be affected should have been involved in the initial discussions. Leaders of the farmers should have been a part of the negotiations and their willingness to accept the project should have been assessed. Unfortunately, obtaining farmer involvement is often neglected until later in project development, if at all.

The USAID has advocated farmer participation throughout a project's development to encourage farmer acceptance and diffusion of the innovations. J. E. Hautaluoma's Using a collaborative style on technical assistance teams, a USAID publication, has a discussion on how to use a participative style on projects.

To encourage early participation by the farmers, it is good to disseminate basic information concerning the project through the leaders of their informal groups. It is usually best if the leaders can be convinced of the value of the project by working with project personnel. The leaders can spread the information and gain support for the project from those they represent. Interviews with farmers and visits to their fields are worthwhile since they indicate an interest by the project staff in working collaboratively.

Another useful early procedure is to develop committees, including farmers, project personnel, and other interested people to study operation of the innovations and means for diffusing the information. This step should be started before the proposal is written, and it may be associated with the Problem Identification and Development of Solutions phases. In the committees, the farmers should be heard, respected, and given positions of importance. Some groups from which the committees can be formed are local water users' associations, groups established by the farm extension service, and agribusiness representatives. These groups can help unite the project with other organizations, which is an aim of most on-farm water improvement programs.

A means of securing credibility for the project is to furnish training for the farmers on the methods that will be used. The role of training farmers is one that should be accepted by project staff during all phases of the contract. It is worthwhile to use demonstrations and utilize farmers' fields when teaching, and to instill confidence in the farmer which, in turn, aids the dissemination process.

After the proposal is approved, farmers must be utilized to help implement the project. They should be involved in the construction, data collection, problem solving, evaluation, and redirection of the work. During implementation, opposition to the changes will probably come from some people who are affected but who did not originally understand the potential impacts. Farmers can help overcome the opposition if they feel they own the project.

During the Project Implementation phase or even earlier, the farmers and project staff must plan how the project's objectives will continue when funding ceases. Together, they must establish social, political, and economic ties that will perpetuate the changes initiated by the project. The farmers and the project staff must decide how to spread the effects of the project to other farmers.

#### Assessing Farmer Motivation to Participate

Project staff must actively plan to obtain farmer participation. To motivate farmers to participate means moving the farmers from awareness of the project to interest in the project, to a desire to try the project innovation, to active trial, and finally to satisfaction.

As a check on the approach used to motivate farmer participation at each of these steps, some questions can be used by project leaders to assess their plans. Some questions concerning awareness include:

Are the benefits of the project visible and communicated to the farmers?

Are the farmers talking to other farmers about the benefits?

Is there a plan for creating widespread awareness to the farmer?

Questions about interest are:

Is farmer interest being assessed?

Are the innovations of the project interesting to the farmers?

Are their interests being used to create a desire and a willingness to try the innovations?

Are interested farmers helping develop interest in other farmers?

Some questions about the farmers' desire for the innovations are:

Do the farmers want to change their present practices?

Have demonstrations shown the difference between the farmer's current methods and what they can be if the innovations are adopted?

Are their needs for change strong enough to encourage full participation in the project?

Questions concerning the farmers' willingness to try the innovation are:

Has the project been designed to give farmers an easy opportunity to participate?

Is their participation appreciated, even when they suggest changes?

Are they given a role in deciding how they will act?

Are they recognized positively for their participation?

The plans to influence satisfaction can be assessed by the questions:

Do farmers regard the program as theirs rather than something that was imposed upon them?

Are they given places of leadership in determining the project's direction?

Is their satisfaction being measured?

Is their satisfaction strong enough for them to desire further change?

What methods are being used to build their satisfaction?

Will they maintain and improve the innovations on their own after the project is completed?

These questions can be used to be sure there is an active, effective program to help motivate participation. The project leader should use the answers to these questions as a guide for developing improved plans.

### Motivating Farmer Participation

Some methods useful for motivating farmers have already been mentioned. Others, mainly practiced by extension agents, are listed below. It is not necessary to utilize all the methods at once, but project leaders should find it helpful to choose those that apply to their situations.

Establishing or strengthening irrigation associations or water users associations and farmer extension services will help increase motivation to participate. If irrigation associations are formed with the help of project staff, it is beneficial to give the farmer sample bylaws and other materials so they will learn organization. Example materials should explain the benefits of the association and contain instructions on how to legally establish an organization. Workers in the extension organization should be knowledgeable about irrigated agriculture and skillful in utilizing extension methods. Extension workers who are informed about local problems and have the confidence of the farmers are most effective. One long-range objective of the project should be to ensure that irrigation associations and extension services are capably run before the project is finished.

The more farmers know about innovations and project objectives, the more likely they will participate in the adoption and diffusion process. Fear of changes resulting from the project is primarily caused by insufficient knowledge about the project and a lack of confidence in achieving the expected results. Therefore, a major component of the project staff's activity must be to design and administer a training program for the farmers, often using irrigation associations and other local entities as the catalyst for initiation.

Besides training, it is important to enhance farmer recognition for working on the project. Where possible, farmers should be given special notice for assisting in the project, trying innovations, having

successful field trials, making progress in improving on-farm water management practices, being a leader in a water users' association, making suggestions, visiting farmers, and other related activities. Radio and television announcements and newspaper articles are good for communicating these accomplishments since they can treat the recognition as a human interest story which will be interesting to many area farmers. The awards should make farmers more aware of good water management practices, help foster efficient practices, and promote cooperation in improving methods. News media coverage of such awards provides incentive to the farmer. Framed photographs of the award-giving or showing the farmer in the improved activity can have high value if the photos are given to the farmers involved. Inscribed plaques describing farmer efforts are also appreciated gifts. Another effective way of recognizing good work is with appropriate personal feedback expressing the appreciation of the project staff and stating how the farmer's efforts facilitated attainment of the project's objectives.

Field days, where local farmers entertain other farmers invited to see their innovations and the effects on crop stands and yields, are good for motivation. They are especially effective if the farmers plan them and they are festive. Special tours by neighboring farmers of the improved area can serve the same purpose. Emphasis in both of these approaches should be on farmer-to-farmer interaction with the local farmers being highlighted rather than the project staff. The staff, however, can subtly facilitate the interaction.

#### Farmer Training Programs

A variety of training sessions should be conducted to increase the farmers' knowledge and confidence in adopting the innovations. This variety ranges from organizational and administrative training to training on technical matters and farmer/government interactions.

Training on organizational and administrative matters is primarily directed to:

1. Creating or utilizing irrigation associations or other forms of local farmer control,
2. Managing and establishing decision-making approaches to assist the functioning of the associations, and

3. Identifying and resolving problems of an organizational and technical nature, as well as those that occur between the water users and the association or among water users.

Because of the need to continue certain administrative duties, farmers may require training in conducting meetings, keeping records, and verbalizing their opinions and needs.

Technical training programs should follow the initial organizational training. This training should advance the levels of awareness consistent with the pace that innovations are being implemented. Certain training sessions will need to be scheduled early in the first project season with others delayed until later or scheduled according to farmer receptivity. Project leaders should identify which technical training will benefit the farmers and develop a PERT diagram for achievement. Technical matters that can be the subject of training consist of:

1. Adoption of and "how-to-do" improved agronomic and irrigation practices
2. Rehabilitation, operation, and maintenance of the water delivery system including allocation and rationing of water supplies, delivery and cultivation schedules, and mobilizing farmer cooperation in rehabilitation and maintenance of structures and channels
3. Adoption and use of improved agronomic inputs such as seed and agricultural chemicals including fertilizers, pesticides, and herbicides
4. Use of other inputs to improve farm production and the quality of agrarian life such as credit and crop storage, processing, and marketing.

Another topic that training programs should include is to inform the farmer about the operations, services, and programs of government agencies and related business enterprises, and how these programs or services can assist. As a component of this training, project leaders should guide the farmers by using irrigation associations to communicate with the government agencies and businesses that can benefit the farmers and their operations. The relationships that can be developed are important for both farmers and officials to better understand the other's roles, duties, and constraints.

Project staff should conduct the training until other persons can be developed who will take over. Support of training by the project can include funding programs for conducting field short courses for farmers at various locations; conducting seminars and demonstrations with project staff and major farmers as trainers; and using other approaches. Inviting principal farmers or officers of irrigation associations to attend selected staff training courses as described in the previous chapter can be helpful.

Farm experience in using new methods learned in training is very important and should be coupled with an examination of the results and feedback from the trainers, and from trainees to the trainers. Training of the farmers should utilize several media rather than just relying on written information. Slides, movies, brochures, tours, meetings, posters, cartoons, exhibits, illustrated and condensed booklets, slogans, lectures, speeches, symposiums, workshops, and method demonstrations can be utilized.

Training should begin with ways to clarify goals, then proceed to designing good training materials and methods of presentation for meeting the goals, selection of those people who will benefit by the training, presentation of training materials in an easily understood manner, and finally, evaluation of the training's effectiveness. Use of news releases in local newspapers and over the electronic media can be useful in highlighting the importance of the training programs.

## ORGANIZING FARMERS

### Role of Irrigation Associations

To successfully implement a program of improved water management at the local level, it is often helpful to enhance an existing institutional structure or to introduce new ones to represent the irrigators and enable them to assume responsibility for its use. In many countries, this local organization is referred to as a Water User's Association, Irrigation Association, Community of Irrigators, or something similar. It is important when translating the name into the national language that it convey the organizations' purpose and importance.

Generally, the basic objectives of local water organizations are to operate, maintain, and rehabilitate the water distribution system at the

farm level in an efficient and effective manner as possible, while promoting proper application and conservation of water on the farm. Specifically, the objectives of an irrigation association might be:

1. To improve and maintain field water delivery channels,
2. To ensure that water will be equitably distributed among farmers throughout the field channels and from the canal to the field channels,
3. To operate the delivery system in a way that prevents unnecessary loss and water waste,
4. To serve as a channel of communication between water users and water controllers, such as the Irrigation Department, on irrigation and crop scheduling, water supply conditions, rotation schedules of distributary channels, and other matters,
5. To resolve disputes among farmers within the organization area, and if necessary assist in enforcement of sanctions against offenders,
6. To encourage adherence to cropping patterns that maximize water use under the particular soils, climatic, and water delivery conditions of the area,
7. Where possible, obtain domestic water from ground water or other sources, and reduce losses resulting from having domestic water run through field channels during periods of nonirrigation,
8. To expand the benefits of cooperation and collective action into other activities common to the irrigators within the delivery system by setting realistic cultivation schedules and cooperating in obtaining needed agricultural implements (sprayers) and production inputs (seeds, herbicides), and
9. To promote improved water management, equitable distribution of available supplies, and conservation of water.

#### Guidelines to Formation

Important aspects of organizations that project staff should consider are size, complexity, difference within the membership, independence from other powerful organizations, values, goals, control by a central administrative unit, and formal rules. Organizations most likely to accept innovations are small but with boundaries based upon the area controlled by a single irrigation outlet. These organizations

are relatively simple in structure; have members with similar interests and values; make their own decisions; have values and goals consistent with those of the project; influence their members; and have rules that farmers will follow.

Several issues must be jointly considered when developing structural models for irrigation associations. They include the nature and structure of the organization, levels of formation, functions to be performed, and culturally appropriate procedures. A detailed analysis of global legal authority on the creation of water users' associations and the formation of irrigation associations is in G. E. Radosevich, Improving agricultural water use: organizational alternatives. The publication, "Improving on-farm water management through irrigation associations" by Layton, et al., provides an illustrated summary presentation about organizing farmers for improving their water management practices.

Water user associations are usually formed according to one of two methods. First, water users may initiate their establishment. Generally, this method is provided under legislation that creates the structure as well as the method of organizing the association. In some countries, water users organize voluntarily according to legislation adopted by the government. Voluntary associations are also formed by necessity where collective action has developed without formal government approval. These organizations represent the customary or traditional pattern and are important to the entire community.

Second, the central government may wish to establish water user associations according to a general national plan or in a region where water shortages require stricter controls on water delivery use and removal of return flows. In this case, the government may have authority to assume the initiative under the same legislation that provided for individual action at the local level. However, the creation of water user associations as management units in some countries such as Mexico is entirely in the province of the government. In these systems, membership is compulsory of all users in the jurisdiction of the association.

Most countries allow water user associations to organize according to the individual initiative of water users under provisions stated in the legislation. Methods of formation and operation are controlled by the

government, and final approval of the association's establishment is with the central government. Formation of voluntary associations typically occurs where economic incentives for increased production are rewarded in the market.

To ensure long-term success of government efforts to increase agricultural production through improving water control and management, it is recommended that formal and legal recognition be granted for the creation of the irrigation organizations. Many independent farmer organizations exist in most countries, often with great success in achieving limited and local goals. To introduce a program nationwide for irrigated areas, it is desirable to establish uniformity and continuity.

The level of formation and structure of the association depends upon the system of irrigation supply channels. It is important to form the organization at the lowest level of common water supply to the farmers served, but high enough on the channel system so it functions effectively. Consequently, primary emphasis of the irrigation associations must focus on water and the constraints and confines of the hydrologic and hydraulic characteristics of the systems, and not the political or agrarian service boundaries or having the association undertake a multitude of other agricultural activities.

Most irrigation delivery schemes consist of the government constructing the surface water diversion and conveyance system with water delivery through a series of canals to the outlet where a farmer or group of farmers receives their allocated water. These canals are referred to as major and minor canals. Often there are larger canals feeding the minor canals and small distributaries, which are still under government jurisdiction, that convey water to the irrigators' outlets. It is assumed that below this government controlled outlet, there are laterals or watercourses within the irrigation area delivering each farmer's share to his field. These laterals or watercourses are controlled by the irrigators they serve and are managed by the association.

The scheme is not disrupted if ground water is a portion of the water supply. Placement of wells is important to the water delivery scheduling program and can be one of the prime tasks of the association if the surface water supply can be supplemented by ground water.

Designing local water user organizations around this physical scheme involves several principles that should be considered by the government and the project.

1. A policy of decentralized, self-management at the watercourse level should be adopted. This principle will induce participation of water users by helping develop pride in the association's operation and stimulating a progressive agricultural economy.
2. The format of the association should be structured similar to existing effective institutions to limit social disruption.
3. Flexibility should be allowed to the agriculturalists in local areas to adopt the types of organizations most acceptable.
4. Not only the positive aspects of forming associations should be discussed, but clear understandings of sanctions and the need for enforcement against infractions of association rules must be considered.
5. The purpose of the organization should justify its existence. An association should have clear purposes and objectives and be publically accountable for the use of public water.
6. Goals of the associations should include improving water delivery and scheduling, and minimization of risk while maximizing production for association members.
7. Composition of the association should be confined to landowners and tenants in the command area and only members actively involved in irrigated farming should be officers.

The authority that should be granted to water users' associations can be divided into four categories: administration, operation, enforcement and dispute solving, and miscellaneous (Table 5). Administration includes supervision of membership, finance, and management. Operation defines or outlines activities related to attaining the purposes and objectives of the association. The enforcement and dispute solving segment determines problems and enforces solutions. As with every organization, there are issues peculiar to the culture and region that require miscellaneous control. Within each of the four general categories specific activities are recommended.

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Table 5. Divisions of authority of water users' associations.

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Administrative Activities

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1. Choose officials and representatives to manage organization.
  2. Create an internal organization to achieve the purposes and authority granted.
  3. Enact bylaws consistent with the purposes of the association. Bylaws should be filed with the government agency in charge of the water association.
  4. Establish authority to borrow, incur indebtedness, accept loans and pledges, levy assessments, impose fines for violation of rules, prepare budgets, and conduct other financial responsibilities.
  5. Incur obligations under contract with the government or private sector consistent with the association's purposes.
  6. Contract for materials and services.
  7. Appoint water masters or ditch tenders.
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Operation Authority

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1. Establish water use principles and delivery schedules.
2. Control water delivery according to rules on distribution and delivery.
3. Survey and inspect water works on farmers' lands.
4. Operate and maintain water works within the organization's boundaries.
5. Require nonwaste of water and prevention of harm to other users.
6. Require on-farm drainage if necessary.
7. Undertake other activities associated with improving water use efficiency and increased production such as watercourse rehabilitation and collective land leveling.

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**Table 5. Divisions of authority of water users' associations (continued).**


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Authority to Enforce Rules and Resolve Disputes

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1. Compel payment of fines or services.
2. Accept complaints from membership.
3. Identify problems and gather facts through investigations and hearings.
4. Decide appropriate solutions and, if necessary, punitive action.
5. Ensure solutions are executed and punitive action enforced.
6. Develop an abatement schedule if a problem requires phasing out so as not to cause undue hardship on anyone.

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Miscellaneous Authority

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1. Obtain credit or commodities related to agricultural production for the membership.
  2. Use eminent domain powers to acquire rights-of-way, lands, water rights, and water facilities necessary to accomplish the purposes of the association.
  3. Establish the right and responsibility to require the association membership to comply with the water and other laws, decrees, and agency rules established by the government; for example, well spacing and ground water pumping rules, and nondumping of wastes into canals.
  4. Gather and disseminate information to membership.
  5. Send representatives to confer and/or work with government officials on matters affecting the association.
  6. Undertake or participate in educational and demonstration programs that benefit the membership.
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The organization should consist of three separate divisions. The first is the governing body or assembly composed of all members. The second is the managing body consisting of elected representatives who serve as officers of an organization. The third is the dispute-resolving body. It may include the same persons as elected to the managing body. These decision-making groups provide a check by the members on association activities and in resolving disputes.

The governing body has several functions. It should:

1. Act as jury and judge on matters solely within the watercourse,
2. Conduct administrative functions of operating and maintaining the system, hiring ditch walkers, and other requirements,
3. Serve as a planning board for improving distribution and utilization of water within the system,
4. Plan cooperative efforts between systems to facilitate delivery of water on demand without disturbing the canal conveyance system, and
5. Be responsible for ensuring that penalties are enacted and water is properly delivered according to predetermined schemes.

In the managing body, representatives are often elected by the entire membership to the "Board of Directors" or "Committee." This is not recommended. An equitable representation on the board of directors from throughout the watercourse area is fundamental to protect the interests and rights of those irrigators located at the end of the watercourse. The board should consist of members representing various areas within the command area.

The managing body could consist of a five-person board or some other number depending upon the size of the watercourse, representing different areas, for instance, one from the beginning of the watercourse, two from the middle, and two from the end. A rotating presidency or chairmanship is suggested with the president selecting a treasurer and secretary, all from within the five representatives. Three-year terms of office are suggested to give the representatives an opportunity to learn leadership skills and issues concerning the watercourse with the terms expiring in a staggered manner. No officer would have any power greater than the other.

A dispute-resolving body can be formed consisting of the president and secretary of the board and three members of the association, one each from the beginning, middle, and end of the watercourse. This group would meet to resolve issues related to the functions and purposes of the association.

In areas where farm plot sizes are fairly uniform, each landholder-cultivator or tenant-cultivator should have one vote. A graduated voting system may be considered for areas where farm sizes vary considerably. Large farm owners may have more than one vote, but much less voting power than if done on the area of cultivated land (for example, one vote for each hectare of irrigated land).

#### Registration Requirements

Serious consideration should be given to having all associations registered with the Irrigation Department or the government agency responsible for water diversion and delivery. In addition, the organizations may need to comply with registration requirements of other laws. Registration is considered essential to develop communication between the government and water users, but not to intimidate the farmers.

#### Hierarchy of Associations

The watercourse level of the water users' association, which is also the lowest level of association, is considered the most essential to improved water management. However, several watercourse associations should combine into higher levels of association, thereby forming a hierarchy. These higher levels of association are recommended to place the irrigators in a better position to implement irrigation scheduling, disseminate information on canal rotation and closures, participate in delivery decisions made by the government, settle disputes, and enforce sanctions. Organizations at all levels should be created under special legislation giving them legal status or formed as voluntary associations under existing company or cooperative laws.

The next level of organization above watercourse associations should be a federation of water user associations at the minor canal and/or village level. In the case where two or more watercourses serve

one village, the commonality of the irrigators' interests is the basis for forming a federation to better manage the village's waters. Composition of this entity should consist of the presidents or chairpersons from the represented associations with one selected as president of the federation. This president, like the president of each association, should have no greater power than any other federation officer. Majority approval should be required for all actions. The canal officer can be a technical advisor to the federation, but should not have voting privileges.

Adding to the hierarchy of water associations would be the formation of a water district organization at the major canal level. The district's main tasks would be to disseminate information on water supplies and deliveries and assist the government to acquire water users' input into the decision-making process. (The canal officer would interact with the federations for the government.) The district organization should have an executive council consisting of presidents or chairpersons from the federations or elected representatives from unfederated minor canals.

Voting rights for the federation and district should be graduated according to land area served. This would prevent a small watercourse or canal command area from over-influencing activities of a large command area. The suggested organizational structures would probably be established over a long time period. This would enable the users, themselves, to make modifications that will match their particular needs.

Irrigation associations at all three levels can become one of the most important resources for improving water management practices of farmers and implementing adaptive technologies and techniques. The associations can help unify elements between a government's plan for allocating and delivering water and the efficient distribution and use by the farmer under varying conditions and constraints. For the associations to operate efficiently, it is necessary for the Irrigation Department to carry out its responsibilities and understand problems faced by the farmer in the total cycle of crop production. It should be mandatory that seminars and workshops be held for field staff and farmers on law changes, new regulations, and functions of the irrigation associations. Positive perceptions and attitudes that

government workers and farmers have about each other are essential for a successful project, and the project staff should work to create understanding between these groups.

## DEVELOPING COMMUNICATIONS WITH OTHER ORGANIZATIONS

An important step in project execution is to devise a communication link to other organizations that will support the project's objectives after the staff withdraws its resources. It is important for the project staff to identify and describe the organizations that can affect the project during implementation and that might help promote its purpose after the staff is no longer present. Many of these organizations may deal directly with the individual farmers or with the leadership of the irrigation associations. An organizational system in which the project is embedded is portrayed in Figure 8. The system describes organizations and inputs that affect the project and the farmers. The system must be coordinated by the project staff if objectives of the project are to be attained.

One way to think about the system is to consider five different classes of organizations that are included in its composition.

1. Enabling organizations allocate the authority and resources for the project to operate. They can consist of donors, ministries of agriculture or irrigation, and rural development organizations among others.
2. Service organizations supply the project with materials, supplies, credit, energy, and resources, and help the farmers market agricultural products, remove wastes, and other agricultural-related tasks. Service organizations include fertilizer and seed suppliers, banks, cooperatives, markets, transportation units, and equipment pools.
3. Normative organizations act as guardians of social values and rules that affect the project and its innovation. They consist of political parties, religious groups, formal farmer groups, educational institutions, and professional associations.
4. Opposing groups have vested interests in certain kinds of activities in the area of the project. Examples might be a forestry department with plans for reforestation that would be upset if an agricultural development project was introduced, or a local, political, or farmer organization that would be changed dramatically by introduction of the project.

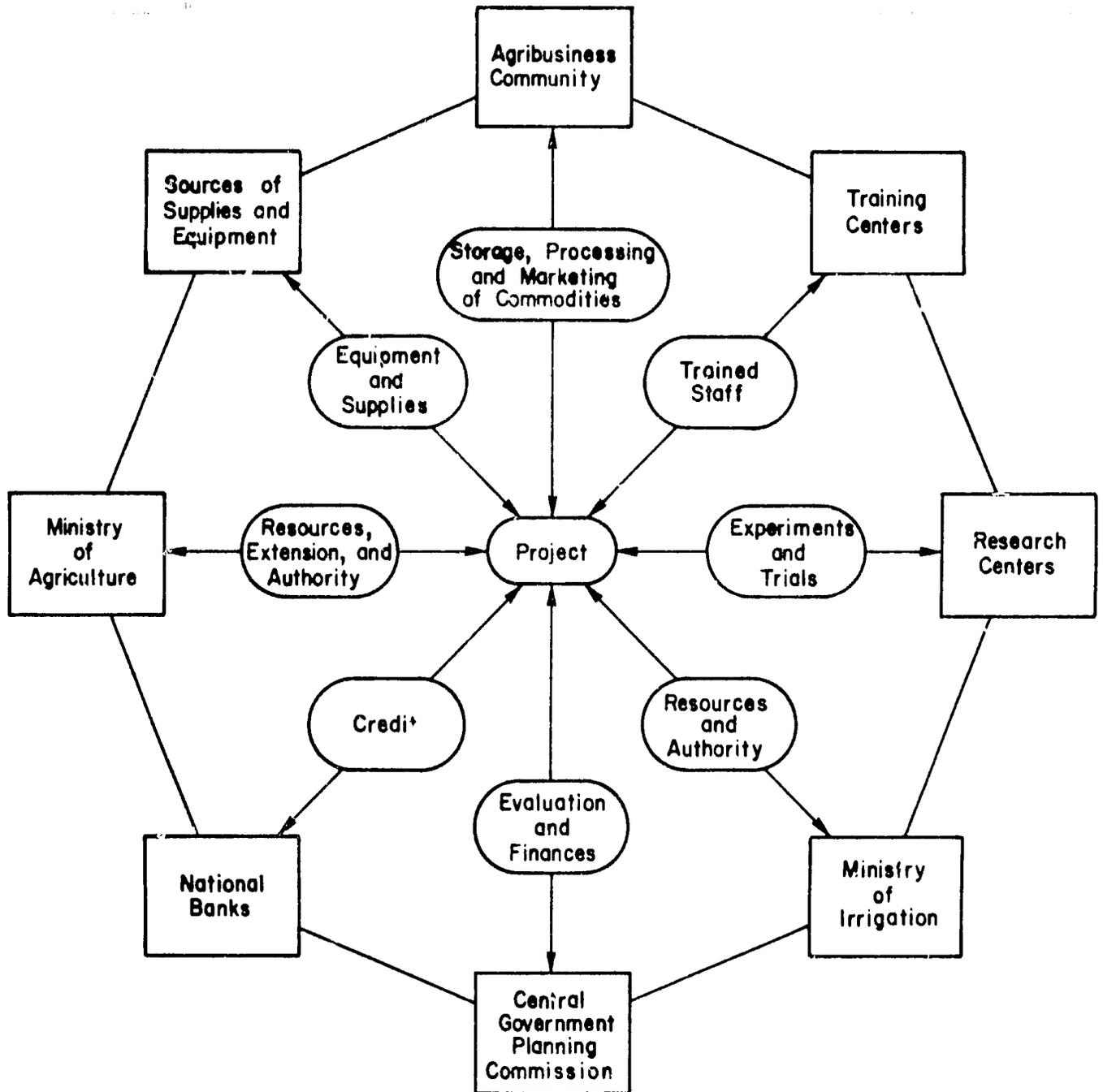


Figure 8. Linkages between organization and project support activities for an on-farm water management development project.

5. Diffuse organizations are related to the project in a variety of ways. These are mostly informal groups that could either influence or be influenced by the project but would not fit into one of the other categories.

Project staff should evaluate each of the classes of organizations to determine how they will be impacted by the project, their influence on the project, and the likelihood of establishing linkages to them to help institutionalize the innovation after the project's funding ceases. It is necessary that all of the organizational classes be evaluated with respect to their specific characteristics. After the assessment, communication should be established to support the project and the farmer organizations created to perpetuate project objectives.

Several steps should be taken to develop contacts with the enabling organizations. First, all the power, authority, and resources of the project should be identified and those people representing the sources should be specified. The project leader should develop relationships with those people, being sure not to offend other influential persons. A common error is to contact an organization at the wrong level and then find that an honest attempt at establishing a positive relationship has been undermined by persons who feel they should have been included. In many cases, it may be necessary to have one contact, but it is also important to be sure that other influential persons such as deputies of the administrators are kept apprised of project activities.

Both personal and formal contacts are needed. It is worthwhile for the project leader and other personnel to be friendly and invite principal contacts to visit their homes, and that these people receive periodic written reports about the project. The project manager may be the only one who can make contacts because these persons usually want to deal with persons of a sufficiently high status. It helps in forming linkages if the project manager can have some formal memberships in strong enabling organizations such as being on an advisory board or a part-time member of one of the organizations' task forces. Inviting important contacts as guests to project activities for tours, and as participants in a presentation of the project to other guests, is a good way to obtain their support for the project.

Establishing linkages to the service organizations is similar to that described above, but the purpose is different. An initial task of the project leader is to determine the major inputs of the project and their sources, and the major outputs and their distribution and marketing organizations. Principal persons in important organizations should be contacted and told of the project's goals and the need for their help in accomplishing the objectives. If there are benefits to their organizations because of a relationship to the project, they should be emphasized. The manager should discuss the advantages for establishing a long-term pattern of service with project recipients to help secure their support for the farmers after project termination. The major service people should be invited to visit the project and be recognized for their help in making the project successful.

If the farmers have formed irrigation associations or other local organizations, the farmer representatives or leaders should develop communication with the appropriate level of the enabling and service organizations. For example, the executive committee of a federation or its chairperson or president should become personally acquainted with the irrigation and agriculture officials at the district and lower levels in order to convey farmer views, receive information on water, and the availability and distribution of other agricultural inputs.

The normative organizations should be determined and their potential for affecting the project or its purposes assessed. Principal leaders of the various groups should be visited by project staff to learn about their support for the project. These people may be able to describe potential cultural, traditional, religious, or political problems for the project, and they should be consulted about how to handle them before implementation of the project proceeds. Project staff should use these people to help learn about possible problems or sources of facilitation for the project. Their ideas should be recognized with letters of thanks, and they too should be invited to the project as honored guests whenever possible.

Most of the opposing organizations may be already known but some may not be discovered without the help of information from members of other organizations. It is advantageous to know as clearly and early as possible which persons and groups are likely to oppose the project. They should be encountered early, but in a cooperative manner seeking

mutually beneficial resolutions. It may be that some of the opposition exist because certain people were not involved in early negotiations for the project, which can be corrected. Other differences can be solved by ensuring a benefit for the persons or groups that resist the project. Still other opposing groups may have such severe differences with the project's objectives that legal means may be required before the project can proceed. In general, it is worthwhile to resolve differences that occur early, and by agreements following a discussion rather than by resorting to legal methods or arbitration. The project manager must work hard to understand the opposition's view and utilize constructive problem solving with them about the issues. When this process is successfully used, often persons opposing the project may convert to supporters and help in project advancement.

The diffuse groups can be approached with many of the same recommendations already listed. They are sometimes more difficult to identify than other groups, but they are among the more important to consider. For instance, cooperatives are included in this class, and by themselves they can furnish some of the impetus to sustain the project's objectives after implementation is completed. Their leaders should be identified and made to feel important for their part in helping the project. As previously mentioned, they should also be trained to lead the institutions that help continue the project innovation after the project terminates. They should participate with the project leader in contacting other group leaders so they will be well-known and accepted by one another after the project leader leaves. Some general points to remember in forming institutional linkages supporting the project objectives are listed.

1. Encourage other organizations to help work on the project during implementation so they will have something invested.
2. Express clear goals for the project that are acceptable to the other organizations.
3. Demonstrate that there is a benefit to the farmers and the organizations in accomplishing the goals.
4. Use good public relation techniques, both through the news media and to the organizations in announcing project progress.

5. Demonstrate the project's benefits with highly visible proof.
6. Show that the benefits support national and regional goals.

## CHAPTER V

### PROJECT ASSESSMENT

Throughout all the phases of conducting on-farm water management development projects, evaluation and improvement of results have been emphasized. However, in the Project Implementation phase, it is especially important to have a specified system for monitoring, evaluating and refining the organization's activities and methods. By this time, a commitment has been made to a specific set of solutions, therefore, options for major modifications are limited. Moreover, the scale of the Project Implementation phase is much larger than was the Problem Identification or Development of Solutions phases. Accordingly, the potential cost of errors is higher. It is vital that results of the implementation process be scrutinized for unexpected impacts.

#### MONITORING

Monitoring consists of establishing a system for inspecting the progress toward goals and the quality of performance. The monitoring network may utilize existing data collection programs by other agencies, but such data will have to be supplemented by a monitoring network operated by project personnel. The design for a monitoring network will be specific for each project; however, potential types of monitoring data common to improving on-farm water management practices can be discussed.

Among the first considerations are agricultural inputs such as credit, seed, and fertilizer. There are four main aspects of measuring agricultural inputs; availability, quality, cost, and quantity of use. Availability of inputs can be measured nationally, regionally, and locally, as well as at banks, distribution centers, and the market place. However, the most reliable information will likely come from farmers themselves. Fertilizer use may be expected to increase if water supplies are enhanced for a fixed acreage. Fertilizer sales should be monitored for areas affected by the project. Benchmark studies are advisable to obtain accurate estimates of changes due to the project. If the project area is large, suitable sampling techniques should be used.

It is important to note that benchmark studies should be simple since the Development of Solutions phase has identified the most important variables to measure.

Cropping acreage is likely to be an index of water availability, as well as type of crops and yields. Easiest to monitor is acreage cropped (available from aerial photos or ground observation), followed by the types of crops. Yields are more difficult to gauge and should be done with good sampling procedures. Farmers judgments about yields should be checked using direct measurements.

Availability of farm labor is almost always a problem for farmers at some point in the cropping year. It is possible that the labor supply affects the quantity or quality of results achieved by the project. Much should already be known of labor use from earlier phases, but when solutions are implemented in new areas there may be variations in labor supply or practices that cause different constraints to appear. Furthermore, time required to irrigate different field sizes, along with measures of the density of crop stands, may be a reasonable index of success in leveling a given field or of a switch to row irrigation. Unfortunately, the best method for measuring this input is observation followed by interviews shortly after the irrigation period. In either case, monitoring labor requires considerable time by project field personnel.

Closely related to labor use are the effects on the project's goals of using bullocks, tractors, and other farm implements. There may be concerns with the efficient use of tractors which needs direct observation, quality of service derived from new implements, or the indirect effect of the project on use of mechanized equipment. The quality of work can usually be observed by inspecting fields. Use of mechanized equipment can be determined by interview. Much of the information may be known from the previous phases of the project, but differences in soil types, terrain, or soil moisture can change the performance of mechanized equipment, as can the quality of training received by the operator. Monitoring for the use and availability of mechanized equipment and effects on labor displacement is a long-term task since changes in labor hiring and land tenure are unlikely to occur in a single season.

Improved on-farm water management practices implies there will be modifications to the water budget in the project's work area. Typically, the modifications will consist of one or more of the following:

1. Reducing losses in the water delivery subsystem,
2. Providing the proper quantity of water to the farmer(s) at the appropriate times for the particular crops being grown,
3. Reducing surface runoff from croplands,
4. Reducing deep percolation losses from croplands while providing a proper leaching requirement to ensure long-term agricultural productivity of the soil, and
5. Lowering ground water levels to facilitate full development of the plant root system, increasing the leaching of salts from the root zone, and allowing the movement of air through the soil interstices so that root respiration can actively occur.

The project goals will stipulate the degree to which any of these modifications are sought. Items 1, 2, and 3 can be measured by installing flow measuring devices or collecting periodic discharge measurements. Item 2 may also require the installation of a weather station(s) in the project's work area if sufficient climatic data is not available for calculating crop water requirements during the irrigation season. Items 4 and 5 require installation of piezometers, unless a sufficient number of wells are located in the project's work area, to monitor the changes in ground water levels resulting from the project.

In addition to increased productivity, project goals may include greater equality of income and improved nutrition and health among persons in the project's work area. Changes in farm income can be projected from results obtained in the Development of Solutions phase by predicting the increased productivity of various sizes and types of farms. These predictions are short-term and can only estimate the direction of change in land tenure and labor use as a result of improved water management. Thus, as previously mentioned, monitoring income change is probably best inferred from monitoring of mechanization, labor use, and land tenure.

The performance of organizations as related to the project should be assessed in terms of contributions to project goals. In most cases, the performances will be evaluated as means to ends. For example, the degree of democratic process in an irrigation association should be assessed. The efficiency of water conveyance and use should also be observed. Sometimes an autocratically run association may look good initially, but the effect of participation should be determined over a long time and in relation to criteria such as satisfaction of farmers, quality of decisions, and willingness to maintain project improvements. This monitoring information must be supplemented with information on progress towards project goals.

## EVALUATION

Evaluation involves relating the changes in use of agricultural inputs and modifications to the water budget upon crop yields, which in turn must be related to socio-economic impacts. These relations are then evaluated and compared to project goals to determine the effectiveness of project implementation.

Besides evaluating the monitoring data which is continuous, it is usually necessary to do supplementary field evaluations that involve the collection of additional data. Monitoring should be streamlined so resources can be concentrated on implementation; however, monitoring can be expected to suggest the need for periodic supplemental evaluations. This approach provides a degree of flexibility that allows project personnel to react to problems as they occur rather than anticipating potential problems. In addition, regularly scheduled evaluations should indicate periodic progress during the implementation process.

During the regular field evaluations, the primary focus will be upon studying the implementation of project activities. These evaluations are an opportunity to interview both field technical personnel and leaders of the water users so difficulties encountered during implementation and suggestions for improvement can be determined.

The impact of project activities on improving both agronomic and water management practices can be determined during field evaluations.

Crops can be inspected for visual evidence of poor crop stands, moisture stress, nutrient deficiencies, or pest infestations. Detailed water budget information is required during the field evaluations, particularly data on quantity and timing of water deliveries to sample farmers and the resulting efficiency of water use according to crop needs.

The sample of farms used for determining changes in agronomic and irrigation practices resulting from the project can also be used in evaluation to gather additional socio-economic data that will help assess project impact on the farmers. Information collected during field evaluations should supplement the monitoring data and help determine recommendations for improving the project's implementation.

Besides describing the objectives and the means of verifying that the goals will be met, the project proposal should have described the assumptions used in designing the project. Evaluators must measure all of the indicators of goals and assess whether the assumptions governing the predictions about the project are true. The recording of critical elements affecting the project should be reported to show why the assumptions did or did not hold.

Good evaluations require baseline data before a project starts as an indicator of change after the project progresses. The change will supposedly result from the work of the project. This is the classic "before and after" design of experimental research.

To be certain the change is due to the project and not some other cause, it is good to measure some indicators on a control sample that did not receive the benefits of the project. Comparison between these measurements with those of the project sample should hopefully show the greatest change occurred in the sample receiving the improved treatment, while the control sample only showed a small amount of change, if any.

While the experimental approach has merits, there are several problems with treating evaluations of projects as if they were experiments. First, project and control samples in field agricultural settings are not easily controlled, and it may be impossible to make them comparable on the influences they experience. The other major problem is that in an experiment the research should predict a result,

produce a stimulus to induce a desired effect, and then measure to see if the expected effect actually occurred. In a project where monitoring and formative evaluation are used, the nature of the project may change dramatically from its first conception, and the cause that was originally expected from the project may not be the desired result after the project changes several times. Unforeseen difficulties, resistances from groups, and inability of the project staff to do certain kinds of work make the project less predictable. A project is continually altered and changed, and evaluating strictly against a predicted objective may be inappropriate.

In addition to project staff evaluations, collecting evaluations from outside the project provides additional information. Information may be determined that is not easily available to the staff such as reports by farmers on the project that they may be unwilling to tell project personnel. Because outside evaluators were not involved in the project, they may be able to determine whether the results occurred or not, rather than knowing why the results happened as they did. They may challenge the project staff's reasons for the results, but their questioning can lead to better understanding of the project's achievements. Outside evaluators will often be experts who can analyze the project from specialized viewpoints that might not be possible by project staff. Finally, these persons should lend credibility to the evaluation because of their objectivity and lack of previous involvement. A good reference for use in designing evaluations of projects is the Evaluation handbook, distributed by the USAID.

The evaluation should be reported to the enabling organizations. The evaluation reports should include measurements of the status of the project and its accomplishments, amount of resources consumed, a review of the comparison of actual performance against the expected performance, a diagnosis of what happened, and suggestions for improving the process on another similar project. As much of the measurements as possible should be from project control data and should be accurate and consistent.

Writing of the reports should consider the needs of the reader. Many evaluation reports overwhelm readers and have no positive effect. The reports should include a major summary and summaries for each

subsection. The significant deviations from the expected results should be highlighted and discussed. Steps that were taken to correct unfavorable trends should be described. The writer should consider the report as having a historical value that some other project leader could use to determine what successful actions could be used and how mistakes could be avoided.

#### REFINEMENT

The refinement process is concerned with implementing the recommendations resulting from the evaluations and involves a reassessment of the project plan. Refinement can consist of minor adjustments to implementation or even major revisions to the project. The primary purpose of refinement is to readjust the mechanics of project implementation and the solutions. The project plan needs to be sufficiently flexible so that experience and evaluation can result in continual improvement to maximize its effectiveness. In addition, the project leader should incorporate beneficial farmer suggestions or innovations. The project must be flexible enough to utilize any other worthwhile solution or innovation consistent with its objectives that might be introduced into the country or project area by other agencies, donors, or individuals.

#### PHASED TRANSFER OF RESPONSIBILITY

In the Development of Solutions manual, a procedure of phased withdrawal of technical support is suggested which transfers as much responsibility to the farmers as is practical. During the implementation process, the capabilities of farmers or their associations to assume the project's activities must be developed because the withdrawal of project staff should be completed at a designated time. To ensure that withdrawal is done in a gradual and orderly way, it should be programmed from the outset so there is complete understanding of the transfer of responsibility by all of those involved. Ideally, the innovation will be integrated into the agricultural system before project personnel start other assignments.

The need for an explicit timetable for the transfer of responsibility arises from the tendencies of project specialists to retain responsibility and farmers, extension agents, and agency personnel to defer to "experts." The transfer must be done so that the responsibilities of the farmers, extension agents, and the supporting organizations become increasingly independent of the project staff.

The more complex the responsibilities, the more important it is for the users to have practice in handling the details of their responsibilities while there is still opportunity for feedback from the project staff. For example, projects that introduce relatively sophisticated machinery require that provisions be made during the project for the maintenance and repair of the equipment. Electric motors for pumps require servicing and repairs often require sophisticated machine shops. Unless such shops are available in the private sector, government agencies will need to provide some services on a regular basis and assist in developing this service locally. It is extremely important that persons responsible for servicing the machines fully understand their obligations and that they have enough practice during the project to develop skill. The project staff should be willing to allow maintenance personnel to repair equipment and to make mistakes so that the technicians, artisans, farmers, and others can develop their ability. The mistakes may affect the project's program during implementation, but the learning should have benefits in ensuring the continuity of the project's objectives after the staff leaves.

One of the more difficult problems is helping irrigation associations to operate independently from their advisors if the associations have not developed independence from the project at their inception. Therefore, it is important for project staff to give advice and direction but not to substitute their efforts for the decision-making responsibilities of the associations and its members. In fact, an important function of the association is to develop a link and channel of communication for gaining technical assistance from government agencies. It is necessary to transfer the advisory role from project staff to staffs of regularly functioning agencies, but with the associations having developed their own capability for making decisions. Ideally, some of the project staff themselves could be transferred to extension or irrigation agencies to help smooth the transition process as the implementation phase finishes.

In summary, the phased transfer of responsibility from the project staff to the agricultural system may be viewed as a period of apprenticeship during which farmers, maintenance and repair personnel, and decision-makers practice their responsibilities and are allowed to be in control. Project leaders should moderate the costs of such mistakes and help decision-makers recognize their errors by using constructive feedback.

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